BULLETIN No. 296 JULY, 1925

VARIATIONS IN THE COMPOSITION OF COLORADO POTATOES

By N. E. GOLDTHWAITE

COLORADO EXPERIMENT STATION, HOME ECONOMICS SECTION
COLORADO AGRICULTURAL COLLEGE
FORT COLLINS

The Colorado Agricultural College

FORT COLLINS, COLORADO

THE STATE BOARD OF AGRICULTURE

J. C. BELL	Montrose	A. A. EDWARDS	Pres., Fort Collins
JOHN F. MAYES	Manitou	J. S. CALKINS	Westminster
W. I. GIFFORD	Hesperus	E. R. BLISS	Greeley
J. B. RYAN	Rocky Ford	MARY ISHAM	Brighton

Ex-Officio { GOVERNOR C. J. MORLEY
{ PRESIDENT CHAS. A. LORY

L. M. TAYLOR, Secretary — L. C. MOORE, Treasurer

OFFICERS OF THE EXPERIMENT STATION

CHAS. A. LORY, M.S., LL.D., D.Sc.	President
C. P. GILLETTE, M.S., D.Sc.	Director
LD CRAIN, B.M.E., M.M.E.	Vice-Director
L. M. TAYLOR	Secretary
ANNA T. BAKER	Executive Clerk

STATION STAFF AGRICULTURAL DIVISION

C. P. GILLETTE, M.S., D.Sc., Director	Entomologist
WM. P. HEADDEN, A.M., Ph.D., D.Sc.	Chemist
G. H. GLOVER, M.S., D.V.M.	Veterinarian
W. G. SACKETT, Ph.D.	Bacteriologist
ALVIN KEZER, A.M.	Agronomist
GEO. E. MORTON, B.S., M.L.	Animal Husbandman
E. P. SANDSTEN, M.S., Ph.D.	Horticulturist
B. O. LONGYEAR, B.S.	Forestry Investigations
I. E. NEWSOM, B.S., D.V.S.	Veterinary Pathologist
L. W. DURRELL, Ph.D.	Botanist
RALPH L. PARSHALL, B.S.	U. S. Irrig. Eng. Irrigation Investigations
R. E. TRIMBLE, B.S.	Assist., Irrig. Investigations (Meteorology)
EARL DOUGLASS, M.S.	Associate in Chemistry
P. K. BLINN, B.S., Rocky Ford	Alfalfa Investigations
MIRIAM A. PALMER, M.A.	Delineator and Assistant in Entomology
J. W. ADAMS, B.S., Cheyenne Wells	Assistant in Agronomy, Dry Farming
N. E. GOLDTHWAITE, Ph.D.	Home Economics Investigations
CHARLES R. JONES, B.S., M.S.	Associate in Entomology
CHARLES I. BRAY, B.S., M.S.	Associate in Animal Investigations
E. J. MAYNARD, B.S.A., M.S.	Associate Animal Husbandman
W. L. BURNETT	Rodent Investigations
FLOYD CROSS, D.V.M.	Assistant Veterinary Pathologist
WM. H. FELDMAN, D.V.M.	Assistant Veterinary Pathologist
J. H. NEWTON, B.S.	Assistant in Entomology
CAROLINE PRESTON	Artist in Botany Section
J. L. HOERNER, B.S.	Assistant in Entomology
J. W. TOBISKA, B.S., M.A.	Assistant in Chemistry
C. E. VAIL, B.S., M.A.	Assistant in Chemistry
C. D. LEARN, B.S., M.A.	Assistant in Botany
DAVID W. ROBERTSON, B.S., M.S.	Associate in Agronomy
I. G. KINGHORN	Editor
R. A. McGINTY, B.S., A.M.	Associate in Horticulture
C. M. TOMPKINS, B.S., M.S.	Assistant in Horticulture
L. A. MOORHOUSE, B.S.A., M.S.	Rural Economics
R. T. BURDICK, B.S., M.S.	Associate in Rural Economics
CHAS. N. SHEPARDSON, B.S., M.S.	In Charge of Official Testing
J. C. WARD, B.S., Rocky Ford	Soil Chemistry
J. W. DEMING, B.S.A.	Assistant in Agronomy
H. B. PINGREY, B.S.	Assistant in Agricultural Economics
IDA WRAY FERGUSON, R.N.	Assistant in Bacteriology
ROSS C. THOMPSON, B.S.	Assistant in Horticulture

ENGINEERING DIVISION

LD CRAIN, B.M.E., M.M.E.	Mechanical Engineering
E. B. HOUSE, B.S., (E.E.) M.S.	Civil Engineering
O. V. ADAMS, B.S., M.S.E.	Associate in Civil Engineering
G. A. CUMINGS, B.S.	Assistant in Mechanical Engineering

VARIATIONS IN THE COMPOSITION OF COLORADO POTATOES

By N. E. Goldthwaite

In the fall of 1919, experiments concerning the cooking quality of potatoes raised in Colorado were begun. In connection with these experiments it seemed desirable to inquire into the chemical composition of the tubers under examination. Hence, for the double purpose of cooking and chemical analyses, a dozen hills each of the Burbank, Rural, Brown Beauty and Pearl varieties were obtained from the San Luis Valley. These hills were hand-dug, and the tubers from each hill were kept entirely separate from the others. That same fall, samples of Burbank, Downing, King, Ohio, Pearl, Rural and Triumph potatoes were obtained from the Greeley district; however, because of the late date, it was impossible then to obtain hand-dug potatoes.

In the fall of 1920 a few hand-dug hills of Burbank, Rural, Brown Beauty and Pearl potatoes were again obtained from the San Luis Valley; and this time, from the Greeley district also. In addition, from the latter locality, samples of Cobbler, Downing, Ohio, Peach Blow and Triumph potatoes were obtained. That same fall, Burbank potatoes were obtained from Carbondale; also Burbank, Cobbler, Ohio, Peach Blow, Pearl and Triumph from the Divide (in El Paso County).

In the fall of 1921 potatoes from the San Luis Valley, Carbondale, Greeley, and from the dryland district near Briggsdale were obtained; these comprised in general the varieties already mentioned, but in addition Blue Victor potatoes from the San Luis Valley, and Gold Coin from Carbondale.

ANALYSES OF INDIVIDUAL TUBERS.—Usually the potato chemical analyses recorded in the literature, have been carried out upon a ground-up mixture of a number of tubers taken together. The several hundred analyses recorded in this bulletin, however, were carried out on the individual tubers;* throughout 1919 and 1920 these analyses were carried out almost invariably in triplicate. In 1921, the triplicate determinations for the percentage of water were discarded, since it had been found that the accuracy of the water determinations permitted of duplicates only; however, all the other determinations were continued in triplicate, unless insufficient material prevented, as occasionally occurred in the case of ash.

NUMBER OF ANALYSES MADE.—Complete analyses, including determination of moisture, starch, nitrogen and ash, were

*A very few exceptions should be made to this statement: Nos. 3, 6, 56, Table II, and Nos. 101, 102, 111, 112, (Table X); mixtures were used in these instances because the tubers under analyses were very small.

made on some 400 individual raw potatoes; partial analyses were made on nearly 100 more; complete analyses were made upon 60 individual cooked potatoes. In 12 potatoes cortex and medullary area were separated as carefully as possible, and complete analyses of the individual cortices and medullary areas made. The average results are recorded in the tables in this bulletin. To secure these average results, between 5,000 and 6,000 separate quantitative determinations were carried out.

NO TWO POTATOES OF IDENTICAL COMPOSITION.—As a result of these several hundred individual potato analyses, it appears that Colorado grows no two potatoes of identical percentage composition. Although, of course, the same general composition holds, yet no two potatoes seem to have exactly the same percentage composition, even when taken at the same time from the same hill.

METHOD OF ANALYSIS

PREPARATION OF TUBERS FOR ANALYSIS.—After much preliminary experimentation, the following scheme of procedure was decided upon: Depending upon the size, the whole potato, or a *lengthwise* half or quarter was used for analysis, the remaining portion, if any, being reserved for cooking. The portion to be analyzed was peeled—the thinnest possible peeling—and then put immediately through a medium-fine food-grinder. As rapidly as possible triplicate samples for water determination were transferred to previously weighed glass petri-dishes; also, triplicate samples for starch analyses were transferred to previously weighed weighing-bottles.

WATER DETERMINATIONS.—The petri-dishes containing the samples for water determinations were weighed as promptly as possible and accurately to the third decimal place, the fourth decimal place being approximated; it was found that any closer weighing of these open-dish freshly ground samples was hardly possible because of their rapid loss of moisture. These samples were then covered with 95% alcohol and the dishes transferred to a Freas electric constant-temperature oven and dried at 55° C. for 72 hours. Any higher temperature seems to dextrinize the product. Without this preliminary treatment with alcohol, the raw potato mass seemed to undergo some decomposition. Depending upon the size of the potato, the weight of samples used for water determination varied from 20 to 50 grams. From the loss in weight between the fresh and dried samples, the percentage of water was calculated. It should be stated that throughout the first season, the 72-hour dried samples, having been ground to a fine powder in a small pulverizing mill, were subjected to three days' further drying over concentrated sulphuric acid in vacuum desiccators. However, there was so little further loss in weight that this additional treatment was deemed

unnecessary and was discontinued during the succeeding seasons.

DRY-MATTER DETERMINATIONS.—Obviously, this determination follows directly from the water determination. The drying of samples leads simultaneously both to the determination of water and of dry matter. Hence, the two are mutually interdependent.

STARCH DETERMINATIONS.—For the determination of starch the Sachsse method (Dept. of Ag. Bul. 107) was used. It was carried out as follows: The closed, previously weighed, weighing bottles containing the potato samples (6 to 7 grams each) were weighed as promptly as possible and accurately to the fourth decimal place. Results, of course, gave data for determining the exact weight of the samples. Each sample was then transferred to a 250 c. c. Erlenmeyer flask and washed into it by means of 200 c.c. of distilled water. Twenty c.c. of 1 : 1 hydrochloric acid was added immediately, and the mixture heated 2½ hours on a water-bath under a reflux condenser. It was then cooled to room temperature, nearly neutralized with strong sodium hydroxide solution, cooled and diluted to exactly 250 c.c. An aliquot portion (25 c.c.) of this solution was then treated with Fehling's solution as follows: Fifteen c.c. of a copper sulphate solution (34.64 g. of copper sulphate and 5 c.c. of concentrated sulphuric acid dissolved in distilled water and diluted to 500 c.c.) and fifteen c.c. of an alkaline sodium-potassium-tartrate solution (178 g. of salt and 50 g. of sodium hydroxide, likewise dissolved and diluted to 500 c.c.) were mixed in a 250 c.c. Erlenmeyer flask, and 50 c.c. of freshly boiled distilled water added; this Fehling's solution mixture was heated 5 minutes on a boiling-water bath, then (if no precipitate had been found), the aliquot portion of the potato solution (25 c.c., one-tenth) was added and the mixture heated 15 minutes longer. The beautiful cuprous oxide precipitate which formed was promptly filtered off into a previously weighed Gooch crucible (fitted with a carefully prepared asbestos pad), washed thoroughly with hot water, finally with alcohol and with ether, then dried to constant weight in an electric oven. From the weight of cuprous oxide obtained the weight of dextrose necessary to form it was determined by reference to the Munson and Walker table for reducing sugars (U. S. Dept. of Ag. Bul. 107). Obviously, nine-tenths the weight of this dextrose equaled the weight of the starch which had produced it; and this weight of starch equaled one-tenth that of the original sample of potato. From the data thus obtained the percentage of starch in the original sample was readily calculated.

It is worth noting that it was found that the asbestos pads made for and used in these determinations could be used for a half dozen or more precipitates before it became necessary to clean them; this, of course, was readily done with concentrated

nitric acid and repeated washings with hot distilled water, and finally with absolute alcohol and absolute ether.

NITROGEN DETERMINATIONS.—Preliminary determinations were carried out at first on fresh samples of potato, and on subsequently dried ones. The two sets of results were so concordant that, in the absence of much laboratory assistance, it was decided to carry out the nitrogen determinations thereafter on the dried material, and to calculate the results subsequently to the fresh basis for comparison.

The weight of the finely ground dried potato found best for the nitrogen determinations was about two grams or slightly less. These determinations, as heretofore indicated, were carried out in triplicate, six digestions being in process simultaneously. They were made according to the Gunning-Arnold-Dyer[1] modification of the Dyer Kjeldahl method, and were carried out as follows: Triplicate dried samples were weighed out by difference from a weighing-bottle, each sample being transferred directly from the weighing-bottle to a 500 c.c. Kjeldahl flask. To each sample were added 10 grams of powdered crystalline potassium sulphate, and 0.7 gram of mercury (measured from a pipette, improvised and graduated for the purpose). The mass was carefully shaken, the 20 c.c. of concentrated sulphuric acid was added in such a way as to wash down the neck of the flask. After careful mixing, the mixture was heated till the resulting solution was colorless, and then for 30 minutes thereafter. The hot, colorless ammonium salt solution in the Kjeldahl flask having been partially cooled, distilled water (200 c.c.) was added and the resulting dilute solution cooled down. While this cooling was in process, each delivery-tube of a Kjeldahl distillation apparatus (properly fitted up with Hopkins distilling heads) was connected with a 250 c.c. Erlenmeyer flask containing a definite number of c.c. of N/10 sulphuric acid. (Each new supply of N/10 sulphuric acid that was prepared was always standardized in triplicate by the barium sulphate method.) When the diluted ammonium salt solution was sufficiently cool, sodium-hydroxide-potassium-sulphide solution (100 c.c., made up of 75 c.c. of concentrated sodium hydroxide to 25 c.c. of a 1:40 potassium sulphide solution) was so carefully added that it sank under the ammonium salt solution; a piece of zinc was added cautiously, and the Kjeldahl flask quickly slipped into position on the distillation apparatus and connected tightly with a distillation tube. The contents of the Kjeldahl flask were carefully mixed, and heat applied, thus driving off the ammonia gas into the N/10 sulphuric acid arranged to imprison it. Subsequent titration of this solution with N/10 sodium hydroxide (standardized exactly with the N/10 sulphuric acid used)

[1] U. S. Dept. of Agriculture, Bureau of Chem. Bul. 107.
Journal of Chemical Society, 67, 811.
Sherman's Organic Analysis, Chap. XIV.

supplied the remaining necessary data by which to determine the weight and percentage of nitrogen in the original dried sample of potato. Knowing the percentage of water previously driven out of this dried material, the percentage of nitrogen in the fresh potato was easily calculated. In the tables given in this bulletin, the percentage of nitrogen, both on the fresh and on the dry basis, has been multiplied by the factor 6.25 and reported as "nitrogenous matter".

ASH OR MINERAL-MATTER DETERMINATIONS.—As in the case of nitrogen, ash determinations were carried out on the previously dried and finely ground potato. As far as material permitted, these determinations also were carried out in triplicate. Samples (2 to 4 g.) were weighed out by difference from a closed weighing-bottle, into previously weighed silica crucibles. Such samples were burned in an electric furnace at the lowest possible red heat. After cooling in a desiccator, the crucibles now containing the ash were reweighed. From the completed data the percentage of ash in the dried samples was readily calculated. From this percentage and the percentage of water in the undried potato, the percentage of ash in the fresh tuber was computed.

FAT DETERMINATIONS.—Since the percentage of fat in potatoes is so low (about 0.1 of one percent) according to all investigations[2], its determination was omitted.

TOTAL CARBOHYDRATES.—The percentages under this head have been calculated by subtracting the sum of the percentages of the nitrogenous matter and ash from the percentage of dry matter. Evidently starch, sugars and crude fiber are included under total carbohydrates. By the method of determination of starch, starch and sugar would appear as one body and be reported as starch. Crude-fiber determinations were not made in these researches, but there was frequent evidence, especially in over-large tubers, that its percentage was high; this evidence consisted in the fact that from such tubers, after cooking, it could be pulled out in stringy masses; the larger the tuber, the more apparent such stringy masses.

PERCENTAGE COMPOSITION OF COLORADO POTATOES

In Table I are recorded the average individual chemical analyses of 338 irrigated potatoes and of 24 dryland potatoes, each of these 362 being tubers above 100 grams (3½ oz.) in weight. Each tuber analyzed is numbered, and its weight, both in grams and ounces, is given. Besides the average percentage composition of each potato in terms of water, dry matter, nitrogenous matter and starch, as determined by analysis, the cal-

[2] See especially U. S. Dept. of Agriculture, O. E. S., Bul. 28, The Chemical Composition of American Food Materials.

culated percentage of carbohydrates (by difference) in each is also given. Each of the two main divisions of the table—irrigated potatoes and dryland potatoes—is arranged primarily by grower and by year,—the growers being designated by number; the varieties of potatoes analyzed for each grower each year are arranged alphabetically, and the locality where they were grown is indicated. For convenience of reference, each group is numbered 1, 2, 3, ... 59, 60, 61. Following the analyses of the individual tubers, the average percentage composition of the tubers composing the group is given, and then the total average of all the tubers for the year for each grower. In the case of growers who supplied potatoes more than one year (Growers I, V, and XI), the total average percentage composition of all the tubers analyzed for each is given. Finally, at the end of Part A, the average percentage composition of all the irrigated potatoes, recorded in the table, appears, and at the end of Part B, the average percentage composition of all the dryland potatoes.

Table II is similar to Part A of Table I, except that it is the analytical record of potatoes below 100 grams in weight; and that in some instances the direct analyses for starch and ash (and consequently of carbohydrates by difference) is lacking. These lacking analyses have been calculated by methods discussed later (see pp. 32-34), and such calculated analyses appear in the table in different type. The groups (1, 2, 3, 4, 40) indicate that they are really parts of corresponding groups in Table I.

Even a cursory examination of Tables I and II quickly shows that the potatoes therein recorded have the same general percentage composition, yet the analytical figures for each tuber vary more or less from those of every other. Wide variations in the percentages of each of the constituents occur in nearly every group, and even in the same hill. These variations when calculated as numerical differences only, are especially striking in the percentages of water, dry matter, total carbohydrates and starch; but when calculated as percentage differences they are frequently more striking in the percentages of nitrogenous matter and ash. Let us consider first the variations of water content and of dry-matter content.

WATER CONTENT VS. DRY MATTER CONTENT.—In Group I the extremes in water content (tubers 59 and 54) are 72.41% and 81.85%—a numerical difference of 9.44, equivalent to about 13%. In Group 2, the water extremes (tubers 90 and 88, Hill V) are 74.64% and 79.27%—a numerical difference of 4.63, equivalent to about 6%. In Group 3, the water extremes (tubers 23 and 1) are 74.18% and 79.58%—a numerical difference of 5.40%, equivalent to about 7%. Similar wide variations in the water content of these potatoes occur in nearly every group throughout Tables I and II. Of the irrigated potatoes, weighing more than 100 grams (Table I), tuber 454, Group 25, has the lowest per-

centage of water, 71.91%, and tuber 203, Group 33, has the highest, 83.31%—a numerical difference of 11.40, equivalent to about 16%. Of the irrigated tubers, weighing less than 100 grams (Table II), tuber 86 (59 grams) has the lowest percentage of water, 71.77%, and tuber 12 (27 grams) has the highest, 85.24%—a numerical difference of 13.47, equivalent to about 19%. In this connection it is worth noting that tubers 78 and 79, Table II, weighing 31 and 30 grams (nearly as small as tuber 12 had but 72.95% and 72.44% of water respectively.

Because of the mutual interdependence of water and dry-matter percentages, it follows that as one decreases the other increases. Obviously, these mutual decreases and increases will be by identical numerical differences; but quite as obviously they will not be by identical percentage differences. For example, in tubers 59 and 54 (quoted above) the water content is 72.41% and 81.85% respectively; hence the corresponding dry-matter content is 27.59% and 18.15% respectively. The numerical difference between these two numbers representing the water content, and between the two numbers representing the corresponding dry-matter content, is identical, 9.44; as we found, this numerical difference is equivalent to about 13% in the case of the water; however, in the case of the dry matter it is equivalent to about 52%.

WATER CONTENT VS. TOTAL-CARBOHYDRATES CONTENT.—The relationship found between water content and dry-matter content is closely paralleled by that between water and total carbohydrates. The content of total carbohydrates varies inversely with the content of water, and directly with the content of dry matter, and this variation is by nearly identical units. For example, in comparing the water content and the dry matter content of tubers 54 and 59, we found a numerical difference in each component of 9.44; if between the same two tubers we compare the total carbohydrates content, 16.12% and 25.26%, we find a numerical difference of 9.14—a difference somewhat less than, but nearly identical, with the preceding.

Likewise, between tubers 88 and 90 we found both between the water content and the dry-matter content a numerical difference of 4.63; between their total-carbohydrate contents (18.26% and 22.94%) the numerical difference is 4.68—a difference slightly higher but yet nearly identical with the preceding.

Throughout Tables I and II, such similar but not quite identical numerical differences occur between the numbers representing the percentages of total carbohydrates in any two tubers, and the numbers representing the percentages of water, or of dry matter. This constant lack of numerical identity is apparently due to the variations always found in the percentages of nitrogenous matter and of ash.

WATER CONTENT VS. STARCH CONTENT.—In general the content of starch varies inversely with the content of water, directly with the content of dry matter, and directly with the content of total carbohydrates. Starch differences between any two tubers are usually by units quite similar to the corresponding differences between water content, dry-matter content, and total-carbohydrates content. As illustrations, such differences between tubers 54 and 59, 88 and 90, 23 and 1, 38 and 44, are tabulated below:

		Numerical Differences in Percentages of:			
Group	Tubers	Water	Dry Matter	Total Carbohydrates	Starch
1	54, 59	9.44	9.44	9.14	9.29
2	88, 90	4.63	4.63	4.68	4.96
3	23, 1	5.40	5.40	5.05	5.22
4	38, 44	3.01	3.01	3.12	3.61

It will be noted that in Groups 1 and 3 the starch numerical differences are larger than the total-carbohydrates numerical differences, but less than the dry-matter (and water) differences; however, in Groups 2 and 4 the starch numerical differences are larger than the corresponding differences in any of the other columns. In general, throughout Tables I and II, starch numerical differences are less nearly identical with the dry-matter (and water) numerical differences than are the total-carbohydrates differences. That is, starch numerical differences vary more among themselves.

Some interesting exceptions to the general statement that the starch content varies approximately inversely with the water content (or directly with the dry-matter content) occur. For example, in Group 32, tubers 220 and 223 have a practically identical water content, 80.15% and 80.14%, but starch contents respectively of 15.02% and 13.88%. Occasionally a whole group of tubers shows wide variations in the percentages of water but an almost constant percentage of starch, as Group 6, in which water varies from 75.90% to 79.95%, while starch is almost constant, 14.04% to 14.60%.

VARIATIONS IN POTATOES FROM THE SAME HILL.—As stated at the beginning of this discussion, each potato recorded in Tables I and II differs in its percentage composition from every other. No two potatoes of identical composition appear in the same variety, or in the same group, or even in the same hill. In this connection it should be recalled that the larger potatoes in every hill are recorded in Table I, while the smaller ones from the same hill are recorded in Table II. Occasionally the analyses of these same-hill potatoes run very close together, as in Nos. 63-64, 66-67, 74-75, 80-81, 95-96, 13-14, 19-21, 173-174, 157-158, 159-160; but more often there occur wide discrepancies as in Nos. 53-56, 57-62, 83-87, and so on throughout the hill analyses. Consideration of any single hill reveals the fact that while there are occasionally groups of two tubers which agree in

their analyses very well, as cited above, yet in each hill, as a whole, wide discrepancies among the individual tubers are the rule. When two tubers from the same hill do agree closely in percentage composition, it would be interesting to know whether or not they grew upon the same root branch.

Frequently in the same hill, potatoes of almost exactly the same weight have been analyzed. It would be expected that such potatoes, if any, would agree in percentage composition. Critical examination of Tables I and II, however, shows that these are no more likely to agree in percentage composition than others; for example, Nos. 59-60, 90-91, 21-22, 168-169, and 171-172 are illustrations of such same-hill potatoes of nearly identical weight, yet whose percentage composition differs materially; while Nos. 157-158 and 159-160 are similar pairs whose percentage composition is nearly identical.

SIZE OF TUBER NO CRITERION OF ITS MATURITY.—In analyzing quantitatively both large and small potatoes from the same hill, it was anticipated that the smaller tubers would be found richer in water and poorer in starch than the larger ones, and so, probably, less mature. This expectation was not confirmed either in the analytical results or in the corresponding cooking experiments. As measured by water and starch percentages, the size of the potato was found to be no criterion of its maturity, nor were the potatoes from a given hill necessarily of the same maturity. Examination of the analyses of these small and large potatoes from identical hills shows that the smaller ones were as likely to be high in starch and low in water content as were the larger ones; conversely, the larger ones were quite as likely to be high in water content and correspondingly low in starch as were the smaller ones. In confirmation of these statements, the water and starch percentages of a few pairs of large and small same-hill tubers (Tables I and II) are here tabulated:

Group	Table	Tuber	Hill	Wgts. g.	Water %	Starch %
1	I	57	III	245	75.70	18.22
	II	62	III	75	73.57	19.45
2	I	72	II	241	78.49	15.46
	II	76	II	79	75.19	17.90
2	I	83	IV	212	77.06	16.59
	II	86	IV	59	71.77	20.73
3	I	1	IV	255	79.58	14.87
	II	3	IV	75+35+39	72.99	19.55
4	I	31	III	309	75.64	18.72
	II	34	III	78	74.72	19.84
4	I	42	VI	181	75.59	18.44
	II	46	VI	95	75.08	19.55

Examination of the above pairs of same-hill potatoes shows that the smaller one of the pair has the lower percentage of water and the higher percentage of starch. Obviously, on very small tubers, both quantitative analyses and cooking experiments

could not be carried out; however, numerous cooking tests of very small and very large same-hill potatoes confirmed these analyses in the probability that the smaller ones often are quite as mature, and sometimes more mature, than the larger ones. Hence, judged by the determined percentages of water and of starch, and by cooking tests, the larger potatoes in a hill are not necessarily more mature than the smaller ones; neither are the tubers large or small, taken from the same hill at the same time, necessarily of the same maturity. These conclusions coincide with the conclusions of Girard,[3] "Maturity is entirely independent of the weight of the potato."

SAN LUIS VALLEY POTATOES OF 1919 VS. 1920.—The striking differences of the starch and water percentages of the potatoes produced in the San Luis Valley in 1919, compared with those produced there by the same grower in 1920, merits attention. The potatoes grown in 1919 in that region had had their full period of growth and were well ripened. Those grown there in 1920 had been caught by a sharp, early frost while the leaves were yet green, and hence had lost two or three weeks of growth. The resulting average differences in water and starch content of such tubers as recorded in Table I are very striking.

Year	Variety	% of Water	% of Starch
1919	Brown Beauty	76.31	17.18
1920	Brown Beauty	80.35	13.47
1919	Burbank	76.81	16.94
1920	Burbank	78.12	14.27
1919	Pearl	76.39	18.28
1920	Pearl	79.91	14.24
1919	Rural	74.29	20.53
1920	Rural	78.84	15.57

It will be noted that those potatoes grown in 1919 are uniformly lower in water content and higher in starch content than those grown in 1920.

If all these analyses be averaged with due regard for the number of potatoes analyzed each year, the results are as follows:

Year	% of Water	% of Starch
1919	76.42	18.68
1920	79.34	14.27

Obviously these averages support the findings of those investigators[4] who assert that the greater proportion of the starch content of potatoes is deposited during the last few weeks of the season's growth, while the leaves are dying in a natural way. Also they are in harmony with the general conclusions of investigators, that the higher the water content in potatoes, the lower their starch content.

[3]Ann. Agron 19 (1893). See also abstract in Exp. Sta. Record 4, 959.
[4]Tidsskr. Norske Landbr. 25 (1918); see abs. in Exp. Sta. Rec. 41, 233.
Vageler, Fuhling's Landw. Ztg. 55, (1906).
Speer, Iowa Exp. Sta. Bul. 12, (1889).

In this connection it is interesting to note that O'Brine[5] says that the higher the water content of potatoes, the higher their protein content, and usually the higher their ash content also. The analyses of these 1919 and 1920 San Luis Valley potatoes accord with this observation in regard to nitrogenous matter content; but not in regard to ash content except in the Pearl variety. The average percentages of these two constituents are as follows:

Year	Variety	Nitrogeneous Matter %	Ash %
1919	Brown Beauty	1.368	0.968
1920	Brown Beauty	1.708	.943
1919	Burbank	1.447	.995
1920	Burbank	1.625	.944
1919	Pearl	1.287	.911
1920	Pearl	1.560	.969
1919	Rural	1.226	1.104
1920	Rural	1.538	.997

The total averages of nitrogenous matter and of ash for each year are as follows:

Year	Nitrogeneous Matter %	Ash %
1919	1.342	1.032
1920	1.622	.960

VARIATIONS IN NITROGENEOUS MATTER AND IN ASH PERCENTAGES.—Since in all potatoes the percentages of nitrogenous matter, and of ash, are comparatively low, the unit differences between the extreme percentages of each of these components in each group are very small; hence, they are not striking as are corresponding unit differences in water and starch. If, however, we compute the percentage differences which such unit differences in nitrogenous matter, and in ash, represent, we often find variations in each of these components of 50%, more or less. For example, in Group 4, Table I, the percentage of nitrogenous matter varies from 0.868 to 1.430 (tubers 38 and 24),—a unit difference of 0.562; computed as a percentage difference, however, the second number is 65% greater than the first; in the same group the percentage of ash varies from 1.001 to 1.520 (tubers 44 and 37),—obviously a percentage difference of about 52%.

Examination of group after group in Tables I and II reveals similar facts throughout. Both nitrogenous matter and ash percentages vary greatly in the same group. There seems to be little, if any, relationship between the two. In the succeeding discussion, attention is called frequently to various facts concerning nitrogenous matter and ash percentages.

[5] Colo. Ag. Col. Bul. 7 (1889).

SOME EFFECTS OF IRRIGATION ON PERCENTAGE COMPOSITION OF POTATOES

STUDY OF GROUPS 42-47.—Attention is called first to Groups 42-47, Table I, three groups of Pearl potatoes and three groups of Rurals. These tubers are representatives of six plots of potatoes grown in 1921 by Mr. W. C. Edmondson at the Greeley Potato Experiment Station. These potatoes were grown under identical soil conditions, but the plots which Groups 42 and 45 represent received three irrigations each; Groups 43 and 46, five; and Groups 44 and 47, seven. It should be noted of each variety of these potatoes that the percentage compositions of the individual tubers within each group vary much; and further, that the percentage compositions of the individuals comprising each group overlap more or less into their companion groups.

In studying these analyses let us first consider the variations in the percentage of water, and its final average in each group: In Group 42 water varies from 77.31% to 82.14%, average 79.14%; in Group 43 from 77.20% to 82.01%, average 78.87%; in Group 44 from 75.41% to 78.50%, average 76.97%; in Group 45 from 77.68% to 79.78%, average 78.70%; in Group 46 from 78.12% to 79.91%, average 78.34%; in Group 47 from 75.27% to 78.85%, average 77.40%. Tabulated, these variations in each group and their averages appear as follows:

Variety	Group	Irrigations	Water Variations	Average
Pearl	42	3	77.31%—82.14%	79.14%
Pearl	43	5	77.20%—82.01%	78.87%
Pearl	44	7	75.41%—78.50%	76.97%
Rural	45	3	77.68%—79.78%	78.70%
Rural	46	5	78.12%—79.91%	78.34%
Rural	47	7	75.27%—78.85%	77.40%

The interesting point about these averages is this: Regardless of the variations in each group and of the overlapping between individuals of the different groups, yet as the number of irrigations increases, the average percentage of water in each group decreases. It may be argued that these decreases are very slight, and that had other tubers from each of the six plots happen to be chosen for analysis, the final averages might not have shown these persistent decreases. Quite true; but, even so, it seems that these averages indicate at least that increasing the number of irrigations certainly has not increased the percentage of water in the tubers, has not led to more watery potatoes as might be anticipated. Instead, it seems to have led to a more starchy potato, as the following tabulation of the variations and final averages of starch in the six groups seems to show:

Variety	Group	Irrigations	Starch Variations	Average
Pearl	42	3	11.61%—15.62%	13.89%
Pearl	43	5	12.74%—15.13%	14.15%
Pearl	44	7	13.71%—16.98%	15.56%
Rural	45	3	12.45%—15.38%	14.09%
Rural	46	5	13.36%—15.88%	14.30%
Rural	47	7	13.41%—17.54%	15.25%

Here, again, regardless of the variations in each group and the overlappings between individuals of different groups, yet as the number of irrigations increases, the average percentage of starch in each group also increases. Or, compared with the percentage of water in the tuber: as the percentage of water decreases the percentage of starch increases. This is quite in agreement with the general interdependence, previously discussed, between the water and the starch contents of the potato.

Furthermore, these results as far as they go, are in agreement with the conclusions reached, at the Utah Experiment Station, after a long series of experiments regarding the effects of irrigation on the water and starch content of potatoes: "There does not seem to be any relation existing between the amount of water received and the amount of moisture in the potato."[6]

"Irrigation has little, if any, effect on the moisture content of the potato" was reported in a later bulletin from Utah.[7]

In the latter bulletin it is further reported that increased irrigation decreases the protein content of the potato, while the percentage of ash does not vary with the amount of water applied. In the present report, reference to Groups 42-47 shows that in each of these groups there are wide variations both in the percentages of nitrogenous matter and of ash; the averages of the former show no progressive change in either group,— being 2.287%, 2.380%, and 2.310% in the three Pearl groups, and 2.341%, 2.352% and 2.248% in the three Rural groups. The average of ash is nearly constant in the Pearl groups,— .936%, .913% and .929%, while in the three Rural groups these averages show a slight increase from group to group,— .869%, .902% and .952%.

STUDY OF GROUPS 48-55.—These groups are representatives of eight different plots of potatoes also grown by Mr. W. C. Edmondson, but in 1922. The writer understands that these plots were grown for reasons other than to test the yields as influenced by different amounts of irrigation water. However, the number of irrigations did vary somewhat, and the average analyses of these groups do present some interesting results,— some of them in agreement with the results from Groups 42-47 and some not.

Of the five groups of Pearls (Groups 48-52), the group (48) which received the highest number of irrigations (eleven) averaged lowest in water (74.33%), and highest in starch (18.33%); while the group (52) which received the lowest number of irrigations (two) averaged highest in water (79.14%) and the lowest in starch (14.21%). The latter group grew in adobe soil. The trend of these average analyses, it will be noted, is in accord with those of Groups 42-47, al-

[6]Richman, Utah Expt. Sta. Bul. 5 (1891).
[7]Utah Expt. Sta. Bul. 80, (1903).

ready discussed. Further, it is interesting that in these 11- and 2-irrigation plots, the average percentages of nitrogenous matter, and of ash are almost identical:

Irrigations	Nitrogeneous Matter %	Ash %
11	2.251	1.014
2	2.280	1.020

Comparison of the average analyses of Groups 49 and 50, from 4- and 7-irrigation plots respectively, shows that Group 49 carried a lower average percentage of water than Group 50 (75.85% and 77.16% respectively); also that Group 49 carried a correspondingly higher percentage of starch than Group 50 (16.51% and 15.08% respectively). These averages, it will be noted, are directly contrary to the trend of Groups 42-47, and also of Groups 48 and 52, just considered. Groups 49 and 50 carried an almost identical percentage of nitrogenous matter (2.831% and 2.884% respectively); but 49, the 4-irrigation group, carried a much higher percentage of ash than 50, the 7-irrigation group; these percentages were .967% and .915% respectively.

Comparison of the average analyses of Groups 50 and 51, each being from 7-irrigation plots, but of different soils (sandy, and medium heavy) shows very little difference in water percentages (77.16% and 77.45% respectively), or in starch percentages (15.08% and 15.63% respectively). Nitrogenous matter, however, shows a decidedly higher average in the sandy soil tubers than in those from the medium heavy soil, these averages being 2.884% and 2.482% respectively. On the other hand, the percentage of ash in the sandy-soil tubers is less than in the medium-heavy-soil ones,— .915% and 1.004% respectively.

Groups 53-55, Rurals, with 8, 10 and 11 irrigations respectively, show no definite trend in average water and starch percentages. The tubers from the 8-irrigation plot have a slightly greater average percentage of water and a slightly less average percentage of starch than from the 10-irrigation plot (77.29% and 76.67% of water, and 15.94% and 16.15% of starch respectively), which facts are in accordance with the trend in Groups 42-47; however, the average water and starch percentages from the 11-irrigation plot (77.26% and 15.69% respectively) coincide closely with those from the 8-irrigation plot. Nitrogenous-matter average percentages follow the trend of the average-starch percentages, being highest in the 10-irrigation plot tubers, —2.193%, 2.335% and 2.206% respectively. Average ash percentages increase slightly throughout these three plots, being .896%, 920% and .979% respectively.

DRYLAND POTATOES

Part B of Table I gives the average analyses of potatoes grown in one of the dryland districts (Briggsdale) of Colorado. These tubers were obtained in 1921 from growers on adjoining farms. Though but 24 of these potatoes were subjected to quantitative analyses, it was reported that they were representative of such potatoes in 1921. The yields of these potatoes were small, but their quality was most delicious.

It is very interesting that both the water content and the starch content vary quite as much among these dryland potatoes as among the irrigated ones, and in much the same way. For example, in tubers 395 and 437 (Group 58) water varies from 76.15% to 79.82%—a unit difference of 3.67, and a percentage difference of about 5%; in the same tubers starch varies from 16.22% to 13.15%—a unit difference of 3.07 and a percentage difference of about 23%.

Still more interesting is the fact that the total average percentages of water in the dryland potatoes and in the irrigated potatoes are almost identical—77.12% and 77.23% respectively; further, that the total average starch content is appreciably less in the dryland potatoes than in the irrigated ones; 15.43% and 16.02% respectively. This difference, if between single tubers, would be comparatively small, but being the difference between the averages of many, it is significant—about 4%.

In regard to their content of nitrogenous matter and of ash, the variations among the dryland potatoes are similar to those among the irrigated tubers. For example, in Group 56 (tubers 432 and 431), nitrogenous matter varies from 3.106% to 2.345%—a numerical difference of .761 but a percentage difference of about 30%; ash (tubers 429 and 432) varies from 1.146% to .870%—a numerical difference of .276 and a percentage difference also of about 30%. However, comparison between the dryland potatoes and the irrigated potatoes regarding their total respective average percentages of nitrogenous matter and of ash, shows that the dryland potatoes are decidedly the richer in these two constituents, as the following summary shows:

	Nitrogeneous Matter %	Ash %
Dryland Potatoes	2.306	1.073
Irrigated Potatoes	2.020	.955

These figures seem to show that though there are many groups of irrigated potatoes in Table I, quite as rich in nitrogenous matter and in ash as are the dryland potatoes, yet, averaged, the dryland potatoes are about 15% richer in nitrogenous matter, and about 12% richer in ash than are the irrigated ones.

TABLE III, TABLE I CONDENSED WITH SPECIAL REFERENCE TO EXTREMES IN PERCENTAGES

Table III is a differently arranged, and a much-condensed form of Table I. Its object is to bring into bold relief the extreme percentage variations which occur within each potato group in Table I.

In Table I the group analytical records are arranged primarily by grower and year; in Table IV, by locality. In Table I the weight of each tuber analyzed is given; in Table IV, only the maximum and minimum weights in each group. In Table I the complete analysis of each tuber appears, followed by the average analysis of the group; in Table IV, no complete analysis of any one tuber appears; instead, in each group, only the maximum and minimum percentages of each constituent appear, followed, as in Table I, by the average percentage composition of the whole group; obviously, such group averages are identical with the averages of the corresponding groups in Table I.

Following such abbreviated records of all groups from each locality, the total number of potatoes analyzed from that locality, with their average percentage composition, appears.

TABLE IV, SUMMARY OF TABLE I, ARRANGED WITH SPECIAL REFERENCE TO GROWERS

This table is a concise summary of Table I arranged to emphasize the average percentage composition of each grower's potatoes, including the average of each of his varieties.

STARCH.—On tracing down the starch column of Part A, it is evident that to Grower I belongs the credit of having produced the most starchy potatoes of one variety—Rurals, with 19.29% of starch. Grower I is followed in order by Grower IX with Gold Coins averaging 18.60% of starch, and by Grower V with Burbanks averaging 18.01% of starch. To Grower V, however, belongs the credit of the highest total starch average. 17.94%. He is followed by Growers IX and I with total starch averages of 16.86% and 16.84% respectively. Arrangement of all the total starch averages according to decreasing percentages, with the corresponding water percentages, gives the following tabulation:

Growers	Tubers Analyzed	Starch %	Water %
V	28	17.94	74.69
IX	22	16.86	75.00
I	106	16.84	76.87
VII	6	16.70	76.65
VIII	6	16.04	76.37
IV	21	15.83	78.03
XI	72	15.24	77.55
X	27	14.81	78.44
III	24	14.72	78.59
VI	26	14.52	79.46

In this tabulation, only the first two, the fourth, and last three of the average water percentages fall into the places in which we should expect to find them; the others do not follow the general principle concerning water and starch percentages already discussed, and which for convenience we may here state in its reversed form: As the percentage of starch decreases the percentage of water increases.

TOTAL CARBOHYDRATES.—If, however, we arrange the total carbohydrates according to their decreasing percentages, with the corresponding water percentages, we find that with but two exceptions the water percentages fall into the places where we should expect to find them:

Growers	Tubers Analyzed	Total Carbohydrates %	Water %
V	28	22.25	74.69
IX	22	21.86	75.00
VIII	6	20.71	76.37
I	106	20.66	76.87
VII	6	20.32	76.65
XI	72	19.12	77.55
IV	21	18.74	78.03
X	27	18.43	78.44
III	24	18.10	78.59
VI	26	17.55	79.46

As will be seen, the two exceptions are the water percentages of the potatoes of Growers VII and I. Since, however, this is an average for Grower VII of but six potatoes, it is quite probable that the record of Grower I is the more nearly exact.

NITROGENOUS MATTER.—Arrangement of the total average percentages of nitrogenous matter of the irrigated potatoes according to decreasing percentages, with the corresponding water percentages, gives the following tabulation:

Growers	Tubers Analyzed	Nitrogeneous Matter %	Water %
XI	72	2.648	77.55
IV	21	2.351	78.03
IX	22	2.254	75.00
III	24	2.239	78.59
X	27	2.201	78.44
VI	26	2.120	79.46
V	28	2.119	74.69
VIII	6	1.990	76.37
VII	6	1.943	76.65
I	106	1.462	76.87

Apparently these decreasing percentages of nitrogenous matter bear no relation to the percentage of water contained in the tubers.

ASH.—Arrangement of the total average percentages of ash of the irrigated potatoes according to decreasing percentages, with the corresponding percentages of water, results in the following tabulation:

Growers	Tubers Analyzed	Ash %	Water %
VII	6	1.082	76.65
I	106	1.002	76.87
III	24	.968	78.59
XI	72	.953	77.55
V	28	.938	74.69
VIII	6	.929	76.37
X	27	.924	78.44
IX	22	.894	75.00
IV	21	.878	78.03
VI	26	.868	79.46

As in the case of the preceding tabulation of nitrogenous-matter percentages, these ash percentages seem to bear no relation to the percentage of water contained in the tubers. However, it is rather interesting that in the nitrogenous-matter tabulation, the potatoes of Growers I and VII are at the bottom of the list, while in this tabulation of ash percentages they are in reversed position at the top of the list.

DRYLAND POTATOES.—Turning to Part B of Table III it is interesting to find that Grower XII produced both the most starchy and the least starchy of the dryland district potatoes—Late Rose, average starch, 16.99%, and Peach Blow, average starch, 13.93%. His Ohio potatoes had nearly as high an average percentage of starch, 16.75%, but a lower average of water, 74.24%, than his Late Rose, 74.87%. The starch and water average percentages of Grower XIII's two varieties of potatoes are nearly identical.

The average ash contents of the potatoes produced by the two growers are nearly the same, while the potatoes of Grower XII averaged much higher in nitrogenous matter than those of Grower XIII. The remarkable drop in nitrogenous-matter content of Grower XII's Peach Blow potatoes below his other three varieties, is particularly noticeable.

TABLE V. SUMMARY OF TABLE I, ARRANGED WITH SPECIAL REFERENCE TO LOCALITIES

This is a concise summary of Table II arranged to emphasize the average percentage composition of the potatoes of each locality: Carbondale, Divide, Greeley, San Luis Valley and Briggsdale. It includes the average percentage composition of each variety of potato grown in each of these localities.

STARCH.—On tracing down the starch column of Part A, it is evident that the potatoes of the Carbondale District lead in high starch content and in low water content—17.31% and 74.99% respectively; the San Luis Valley potatoes are a close second with 16.84% of starch and 76.87% of water, while the potatoes of the Greeley District with 15.16% of starch and 77.98% of water, and the potatoes of the Divide with 14.91% of starch and 78.68% of water, follow in order. In this connection, it should be noted that the potatoes from the Divide were got only one year, 1920; potatoes from there analyzed in other years also, might have modified this final average materially.

Arranged according to total average increasing percentages of starch, with the corresponding percentages of water, the localities raising irrigated potatoes appear in the following order:

Localities	Tubers Analyzed	Starch %	Water %	Total Carbohydrates %
Carbondale	56	17.31	74.99	21.93
San Luis Valley	106	16.84	76.87	20.66
Greeley	144	15.16	77.98	18.59
Divide	32	14.91	78.69	18.27

It should be noted that as these total average percentages of starch decrease, the corresponding total average percentages of water increase; there are no exceptions. For convenience, the prcentages of total carbohydrates are included in this tabulation. It will be noted that they also, without exception, fall into their proper places.

It is worthy of note that the dryland potatoes in their total average percentage of starch, of water and total carbohydrates (15.43%, 77.12% and 19.49% respectively) lie between the Carbondale and San Luis Valley Districts on the one side, and the Greeley and Divide Districts on the other.

NITROGENOUS MATTER AND ASH.—It is particularly noticeable that the potatoes from the San Luis Valley averaged much lower in total nitrogenous-matter content than any of the others, while their ash content averaged highest, these two averages being respectively 1.462% and 1.002%. Conversely, the potatoes from the Greeley District averaged highest in nitrogenous-matter content, 2.491% and next to the lowest in ash content, .939% —the Carbondale potatoes being slightly lower in ash, .921%.

In the dryland potatoes the nitrogenous-matter content (2.306%) is nearly equal to that of the Greeley District, while their total average ash content (1.073%) is considerably above even that of the San Luis Valley.

TABLE VI, SUMMARY OF TABLE I, ARRANGED WITH SPECIAL REFERENCE TO VARIETIES OF POTATOES

This is another summary of Table I, but arranged in this instance to emphasize varieties of potato. In it, the average percentage composition of all the tubers analyzed of each variety, from all growers, are grouped together for comparison; the total average-percentage composition completes the average record of each variety.

LACK OF UNIFORMITY OF COMPOSITION.—Examination of this record of each variety emphasizes the fact that there is no definite percentage composition of any variety. The percentage composition of each variety varies with each grower, and apparently varies almost as much as the tubers vary among themselves (Table I). The average percentage composition of a potato variety apparently is no more fixed than is the percentage composition of the individual tubers within the variety.

Burbanks, for example, obtained from seven different growers and of which one hundred (each over 100 grams in weight) were analyzed, vary in starch content per grower from 18.01% to 14.45%—a numerical difference of 3.56, or of 24%. Pearls, (four growers, sixty-nine tubers recorded) vary in starch content per grower from 17.00% to 13.35%—a numerical difference of 3.65 or 27%. Rurals (four growers, sixty-two tubers recorded) vary in starch content per grower from 19.29% to 14.80% —a numerical difference of 4.49 or 30%.

STARCH.—On tracing down the starch and water total averages of these potato varieties, we discover that the Gold Coin potatoes lead in high average starch content (18.60%) and in low average water content (72.95%). Second to these are the Burbank potatoes with an average of 16.49% of starch and 76.33% of water. In this connection, however, it should be emphasized that the eight Gold Coin potatoes recorded were analyzed from only one locality and in only one year, 1921, while the one hundred Burbank potatoes recorded were got from all four of the irrigated sections and in all four years, 1919, 1920, 1921, 1922. The Gold Coin potatoes when cooked were delicious, second in flavor only to the dryland potatoes, yet it is quite possible that these potatoes grown in other sections, or in other years in the same section would show just as great differences in average percentage composition as occur among the other varieties. The same sort of reasoning may apply to the irrigated Peach Blow and Triumph potatoes which of all the potatoes analyzed were found to average the lowest in starch (14.87% and 13.08% respectively), and the highest in water (79.28% and 81.69% respectively). In this connection, however, it is rather interesting that the average starch and water percentages of the irrigated Peach Blows is very close to that of dryland Peach Blows: 14.87% vs. 14.34% of starch, and 79.28% vs. 79.03% of water, respectively. Finally, arranging all of the irrigated varieties of potatoes according to their decreasing percentages of starch, with the corresponding percentages of water, gives the following tabulation:

Varieties	Tubers Analyzed	Starch %	Water %
Gold Coin	8	18.60	72.95
Burbank	100	16.49	76.33
Cobbler	24	16.18	77.09
Rural	62	16.12	77.34
Blue Victor	6	15.74	77.45
Ohio	15	15.67	77.97
Brown Beauty	25	15.66	77.45
Pearl	69	15.50	77.87
Downing	4	15.49	76.78
Peach Blow	19	14.87	79.28
Triumph	6	13.08	81.69

Examination of the order of the water percentages in this tabulation shows that only the first two and the last two fall into the exact places in which we should expect to find them.

TOTAL CARBOHYDRATES. — Arranging these irrigated varieties according to their decreasing percentages of total carbohydrates, with the corresponding percentages of water, the order of the varieties is changed somewhat, as the following tabulation shows:

Varieties	Tubers Analyzed	Carbohydrates %	Water %
Gold Coin	8	23.80	72.95
Burbank	100	22.88	76.33
Blue Victor	6	20.07	77.45
Cobbler	24	20.02	77.09
Brown Beauty	25	19.89	77.45
Rural	62	19.63	77.34
Downing	4	19.40	76.78
Pearl	69	19.11	77.87
Ohio	15	18.53	77.97
Peach Blow	19	18.05	79.28
Triumph	6	15.30	81.69

Examination of the order of the water percentages shows that the first two and the last four fall into the places where we should expect to find them—a more satisfactory record than the preceding.

NITROGENOUS MATTER AND ASH.—Arrangement of the irrigated varieties according to their average decreasing percentages of nitrogenous matter, with the corresponding percentages of water gives the following tabulation:

Varieties	Tubers Analyzed	Nitrogeneous Ash %	Water %
Downing	4	2.881	76.78
Ohio	15	2.578	77.97
Gold Coin	8	2.286	72.95
Triumph	6	2.265	81.69
Pearl	69	2.080	77.87
Rural	62	1.985	77.34
Cobbler	24	1.957	77.09
Burbank	100	1.928	76.33
Peach Blow	19	1.799	79.28
Brown Beauty	25	1.668	77.45
Blue Victor	6	1.432	77.45

A similar arrangement of the average ash percentages results as follows:

Varieties	Tubers Analyzed	Ash %	Water %
Rural	62	1.047	77.34
Blue Victor	6	1.032	77.45
Brown Beauty	25	.991	77.45
Gold Coin	8	.958	72.95
Burbank	100	.946	76.33
Pearl	69	.943	77.87
Downing	4	.936	76.78
Ohio	15	.924	77.97
Cobbler	24	.911	77.09
Peach Blow	19	.871	79.28
Triumph	6	.746	81.69

From these tabulations it appears that in these potato varieties neither the average nitrogenous-matter content nor the average ash content bears any relation to the corresponding average water content. Moreover, nitrogenous-matter content and ash content seem to bear no relation to each other.

APPROXIMATE CONSTANTS IN THE COMPOSITION OF POTATOES

A few investigators have pointed out certain approximate constants in the percentage composition of potatoes.

RELATION OF STARCH CONTENT TO WATER CONTENT.—It has been pointed out by Snyder[8] that one-fifth the weight of the potato is starch. Obviously, this is true when the potato is about 20% starch. This is a larger percentage of starch than the majority of potato analyses published by the Experiment Stations of this country indicates. According to such analyses, 20% of starch in potatoes is the exception rather than the rule. However, total carbohydrates frequently run to 20% or more. Hence, if the statement be interpreted to mean total carbohydrates equal one-fifth the weight of the potato, it holds very well for the final average of total carbohydrates (19.79%) recorded in this bulletin. Examination, especially of Tables III, V and VI, shows that the potatoes of certain growers, also that certain varieties of potatoes, and that the potatoes of certain localities averaged above 20% of total carbohydrates, while others averaged somewhat below it.

RELATION OF STARCH TO DRY MATTER.—Another approximate constant found in the literature on potatoes is the following: The dry matter of potato is about two-thirds starch.[9] Reference to the various averages especially in Tables I, III and V shows that this approximate constant holds fairly well, though in these potatoes the percentage of starch averages rather more than two-thirds the percentage of dry matter, never less.

PERCENTAGE OF NON-STARCHY DRY MATTER.—Another approximate constant worked out by Hals[10] is the following: The non-starchy dry matter of potatoes varies from 5.39% to 6.49%. Later, Hals and Buchholz[11] announced that the non-starchy dry matter of potatoes averages 5.74%. Subsequently, Matzdorff and Grossbauer[12] made the following statement: The difference between the total solids and the starch content is a constant 5.752; or, approximately the percentage of dry matter less 5.8 gives the percentage of starch.

In connection with the data obtained in the present research, determinations of this and other possible approximate constants have been made. The average results so obtained are recorded in Tables VII, VIII and IX. Among the different growers, the different localities, and the different varieties of potatoes, the averages of the constant under discussion (dry matter %—starch %) are as follows:

---

[8]Snyder, Minn. Expt. Sta. Bul. 42.
[9]Wilson, Nevada Expt. Sta. Bul. 14 (1891).
[10]Tidsskr. Norske Landbr. 14 (1907); see abs. in Exp. Sta. Rec. 20, 637.
[11]Tidsskr. Norske Landbr. 16 (1909); see abs. in Exp. Sta. Rec. 23, 113.
[12]Phann. Zentralhalle, 61 (1920); Chem. Abstract 15, 560.

DRY MATTER % — STARCH %

GROWERS (Table VII)		LOCALITIES (Table VIII)		VARIETIES (Table IX)	
IRRIGATED POTATOES					
I	6.29	Carbondale	7.70	Blue Victor	6.81
III	6.69	Divide	6.41	Brown Beauty	6.89
IV	6.14	Greeley	6.86	Burbank	7.18
V	7.37	San Luis Valley	6.29	Cobbler	6.73
VI	6.02			Downing	7.72
VII	6.65			Gold Coin	8.45
VIII	7.59			Ohio	6.69
IX	8.14			Peach Blow	5.34
X	6.75			Pearl	6.50
XI	7.21			Rural	6.54
				Triumph	5.22
Avg.	6.71		6.71		6.71
DRYLAND POTATOES					
XII	7.78	Briggsdale	7.45	5 Varieties	6.46-9.01
XIII	6.54				
Avg.	7.45		7.45		7.45

It will be noted that among the irrigated potatoes this constant varies by grower from 6.02 to 8.14, by locality from 6.29 to 7.70, by variety of potato from 5.22 to 8.45, the average in each case for the 338 irrigated potatoes being 6.71, about one unit higher than the average constant worked out by Hals et al. In the dryland potatoes of this State its average is yet higher, 7.45.

It is self-evident that the factors which make up this so-called constant (dry-matter percentage — starch percentage) must include the sum of the percentages of nitrogenous matter, ash, crude fiber (and fat). As we have seen, the percentages of nitrogenous matter and of ash, at least, vary widely among themselves—hence, the wide variations found in this region in this so-called constant. Among irrigated potatoes it averages about 6.71; among dryland potatoes about 7.45.

Evidently, the percentage of dry matter in potatoes, less this constant, 6.71, will probably be approximately equal to the percentage of starch in Colorado irrigated potatoes.

OTHER APPROXIMATE CONSTANTS

Even though the percentage composition of the potatoes analyzed in this research showed wide variations among the individual tubers, yet with so large an amount of data it seemed possible that other approximate constants than those cited in the literature might be found—constants, approximate at least for this region, though they might not hold in other countries, nor even in other parts of this country. Exhaustive search for such constants led to the following possibilities:

RATIO OF STARCH TO DRY MATTER.—In Colorado-grown potatoes the ratio of the percentage of starch to the percentage of dry matter averages about 1:1.42; in dryland potatoes about 1:1.48. The variations of this ratio among the potatoes of the different growers, of the different localities, and among the different varieties themselves (Tables VII, VIII and IX) are as follows:

STARCH %: DRY MATTER %

IRRIGATED POTATOES					
GROWERS (Table VII)		LOCALITIES (Table VIII)		VARIETIES (Table IX)	
I	1:1.367	Carbondale	1:1.444	Blue Victor	1:1.432
III	1:1.455	Divide	1:1.410	Brown Beauty	1:1.408
IV	1:1.402	Greeley	1:1.455	Burbank	1:1.430
V	1:1.408	San Luis Valley	1:1.367	Cobbler	1:1.428
VI	1:1.416			Downing	1:1.498
VII	1:1.384			Gold Coin	1:1.451
VIII	1:1.444			Ohio	1:1.442
IX	1:1.482			Peach Blow	1:1.401
X	1:1.454			Pearl	1:1.428
XI	1:1.475			Rural	1:1.406
				Triumph	1:1.399
Avg.	1:1.421		1:1.421		1:1.421
DRYLAND POTATOES					
XII	1:1.495	Briggsdale	1:1.482	5 Varieties	1:1.438-1:1.538
XIII	1:1.442				
Avg.	1:1.482		1:1.482		1:1.482

It will be noted that among the irrigated potatoes this ratio varies according to grower from 1:1.367 to 1:1.482; according to locality from 1:1.367 to 1:1.455; according to variety of potato from 1:1.399 to 1:1.498. Its lowest average (1:1.367) is found among the potatoes grown in the San Luis Valley, where it varies (Table VII) from 1:1.279 (Rural) to 1:1.432 (Blue Victor). Its highest value among irrigated potatoes is found in the potatoes grown in the Greeley District, where it varies (Table VIII) from 1:1.413 (Ohio) to 1:1.498 (Downing).

Obviously, either the percentage of starch or of dry matter in irrigated potatoes being known, then by application of this constant ratio, 1:1.42, the percentage of the other may be approximately calculated.

RATIO OF TOTAL CARBOHYDRATES TO DRY MATTER.—This ratio in irrigated tubers averages 1:1.15, in the dryland potatoes slightly higher, 1:1.17. The variations of this ratio among the potatoes of the different growers and localities and among the different varieties themselves are as follows:

TOTAL CARBOHYDRATES %: DRY MATTER %

IRRIGATED POTATOES					
GROWERS (Table VII)		LOCALITIES (Table VIII)		VARIETIES (Table IX)	
I	1:1.120	Carbondale	1:1.139	Blue Victor	1:1.123
III	1:1.172	Divide	1:1.179	Brown Beauty	1:1.133
IV	1:1.180	Greeley	1:1.160	Burbank	1:1.134
V	1:1.134	San Luis Valley	1:1.120	Cobbler	1:1.151
VI	1:1.186			Downing	1:1.196
VII	1:1.148			Gold Coin	1:1.136
VIII	1:1.139			Ohio	1:1.201
IX	1:1.145			Peach Blow	1:1.171
X	1:1.168			Pearl	1:1.158
XI	1:1.148			Rural	1:1.154
				Triumph	1:1.196
Avg.	1:1.150		1:1.150		1:1.150
DRYLAND POTATOES					
XII	1:1.173	Briggsdale	1:1.173	5 Varieties	1:1.165-1:1.181
XIII	1:1.173				
Avg.	1:1.173		1:1.173		1:1.173

It will be noted that among the irrigated potatoes this ratio varies according to grower from 1:1.120 to 1:1.186; according to locality from 1:1.120 to 1:1.179; according to variety from 1:1.123 to 1:1.196. Its highest value among irrigated potatoes is found in the potatoes grown on the Divide, where it varies (Table VIII) from 1:1.146 (Cobbler) to 1:1.210 (Peach Blow); its lowest value is found in the potatoes grown in the San Luis Valley, where it varies from 1:1.098 (Cobbler) to 1:1.130 (Peach Blow). It is self-evident that the more nearly this ratio approaches unity the more nearly identical are the dry matter and total carbohydrates percentages. It is also self-evident that in general as the percentage of dry matter increases, the percentage of starch also increases.

Obviously, either the percentage of total carbohydrates or of dry matter in irrigated potatoes being known, then by application of this constant ratio, 1:1.15, the approximate percentage of the other may be calculated.

RATIO OF STARCH TO TOTAL CARBOHYDRATES.—This ratio in irrigated potatoes averages about 1:1.24; in dryland potatoes, slightly higher, about 1:1.26. The variations of this ratio among the potatoes of different growers, the different localities, and among the different varieties are as follows:

STARCH %: TOTAL CARBOHYDRATES %

GROWERS (Table VII)		LOCALITIES (Table VIII)		VARIETIES (Table IX)	
IRRIGATED POTATOES					
I	1:1.220	Carbondale	1:1.279	Blue Victor	1:1.275
III	1:1.255	Divide	1:1.197	Brown Beauty	1:1.257
IV	1:1.184	Greeley	1:1.243	Burbank	1:1.249
V	1:1.236	San Luis Valley	1:1.220	Cobbler	1:1.238
VI	1:1.195			Downing	1:1.252
VII	1:1.205			Gold Coin	1:1.280
VIII	1:1.279			Ohio	1:1.196
IX	1:1.287			Peach Blow	1:1.196
X	1:1.244			Pearl	1:1.233
XI	1:1.258			Rural	1:1.218
				Triumph	1:1.173
Avg.	1:1.237		1:1.237		1:1.237
DRYLAND POTATOES					
XII	1:1.274	Briggsdale	1:1.263	5 Varieties	1:1.229-1:1.314
XIII	1:1.229				
Avg.	1:1.263		1:1.263		1:1.263

It will be noted that among the irrigated potatoes this ratio varies according to grower from 1:1.184 to 1:1.287; according to locality from 1:1.197 to 1:1.279; according to variety from 1:1.173 to 1:1.280. Its highest value among the irrigated potatoes is found in the potatoes grown in the Carbondale District, where it varies (Table VIII) from 1:1.255 (Cobbler) to 1:1.280 (Gold Coin); its lowest value is found in the potatoes grown on the Divide, where it varies from 1:1.146 (Cobbler) to 1:1.210 (Peach Blow). Evidently, the more nearly this ratio approaches unity, the more nearly identical is the starch percentage with the total carbohydrates percentage.

Obviously, either the percentage of starch or of total carbohydrates in irrigated potatoes being known, then by application of this constant ratio, 1:1.24, the percentage of the other may be approximately calculated.

RATIO OF STARCH TO WATER.—This ratio in irrigated potatoes averages about 1:4.82; in dryland potatoes about 1:5. Its variations among the potatoes of the different growers, the different localities, and among the different varieties are as follows:

STARCH %: WATER %

IRRIGATED POTATOES

GROWERS (Table VII)		LOCALITIES (Table VIII)		VARIETIES (Table IX)	
I	1:4.571	Carbondale	1:4.368	Blue Victor	1:4.921
III	1:5.350	Divide	1:5.359	Brown Beauty	1:4.811
IV	1:5.007	Greeley	1:5.174	Burbank	1:4.558
V	1:4.190	San Luis Valley	1:4.571	Cobbler	1:4.819
VI	1:5.547			Downing	1:4.828
VII	1:4.543			Gold Coin	1:3.922
VIII	1:4.568			Ohio	1:4.953
IX	1:4.481			Peach Blow	1:5.324
X	1:5.282			Pearl	1:5.021
XI	1:5.106			Rural	1:4.841
				Triumph	1:6.245
Avg.	1:4.821				1:4.821

DRYLAND POTATOES

XII	1:4.927	Briggsdale	1:5.029	5 Varieties	1:4.407-1:5.029
XIII	1:5.334				
Avg.	1:5.029		1:5.029		1:5.029

It will be noted that among the irrigated potatoes this ratio varies widely; according to grower, from 1:4.190 to 1:5.547, a variation of 32%; according to locality from 1:4.368 to 1:5.359, a variation of 22%; according to variety from 1:3.922 to 1:6.245, a variation of 59%. Its highest value among the irrigated potatoes is found in the potatoes grown on the Divide, where it varies (Table VIII) from 1:4.543 (Burbank) to 1:6.391 (Triumph); its lowest value is found in the potatoes grown in the Carbondale District, where it varies from 1:3.922 (Gold Coin) to 1:4.444 (Burbank). Certain other points regarding the variations in these starch-to-water ratios will be considered under the discussion of the ratio of total carbohydrates to water,—the next general topic.

However, before passing on to that topic, it should be said that the variations in these starch-to-water ratios are so wide that they can scarcely be said to have any relation to a constant. Clearly, these wide variations are due to the large differences in starch content and in water content found in potatoes: The lower the numerical value of this ratio, the drier and starchier the potato; conversely, the higher its value, the more watery and the less starchy the potato.

At first thought it would seem that the percentages of water in potatoes being known, it should be possible to use the average of this ratio, 1:4.82 (irrigated potatoes) to determine their ap-

proximate percentages of starch. But such quotients are misleading for the following reasons: The higher the water percentages, the higher such quotients, and the lower the water percentages, the lower such quotients; to interpret them in corresponding terms of starch percentages is obviously incorrect, since starch percentages do *not* vary directly with water percentages, but, *inversely*, as already pointed out. Hence, the number 4.82 must be considered a very doubtful constant.

RATIO OF TOTAL CARBOHYDRATES TO WATER.—This ratio in irrigated potatoes averages about 1:3.897; in dryland potatoes about 1:3.986. Its variations among the potatoes of the different growers, the different localities, and among the different varieties are as follows:

TOTAL CARBOHYDRATES %: WATER %

GROWERS (Table VII)		LOCALITIES (Table VIII)		VARIETIES (Table IX)	
IRRIGATED POTATOES					
I	1:3.746	Carbondale	1:3.438	Blue Victor	1:3.858
III	1:4.411	Divide	1:4.405	Brown Beauty	1:3.894
IV	1:4.215	Greeley	1:4.169	Burbank	1:3.606
V	1:3.377	San Luis Valley	1:3.746	Cobbler	1:3.878
VI	1:4.629			Downing	1:3.958
VII	1:3.438			Gold Coin	1:3.064
VIII	1:3.438			Ohio	1:4.101
IX	1:3.445			Peach Blow	1:4.411
X	1:4.222			Pearl	1:4.075
XI	1:4.072			Rural	1:4.000
				Triumph	1:5.342
Avg.	1:3.897		1:3.897		1:3.897
DRYLAND POTATOES					
XII	1:3.863	Briggsdale	1:3.986	5 Varieties	1:3.373-1:4.494
XIII	1:4.338				
Avg.	1:3.986		1:3.986		1:3.986

In this ratio of total carbohydrates to water we also have very wide variations; according to grower from 1:3.377 to 1:4.629, a variation of 34%; according to locality from 1:3.438 to 1:4.405, a variation of 28%; according to locality from 1:3.064 to 1:5.342, a variation of 74%. These variations are even more pronounced than the variations in the ratios between starch and water, already discussed. It will be noted both in the ratios between starch and water and those between total carbohydrates and water, that the very high variations are due largely to the potatoes of Grower VI, to the Divide, and to the Triumph variety. Excluding these, we find the percentage variation in the ratios between starch and water reduced from 32%, 22% and 59% (see p. 28) to 27%, 18% and 35%. Making the same exclusion in the ratios between total carbohydrates and water, we find these ratios reduced from 34%, 28% and 74% (see above) to 28%, 21% and 28% respectively. Even so, these ratios vary too much to be considered constants.

The reason for these wide variations is very apparent: The percentage of total carbohydrates varies inversely with the percentage of water just as the percentage of starch does. Hence, only approximately can we say that the percentage of total carbohydrates to water is as 1:3.90; this is an average of very different ratios, just as the ratio of the percentage of starch to water, 1:4.82, is. The same objections to the use of the latter that we found (see p. 28) also hold to the use of the former. The number, 3.90, must also be considered a very doubtful constant.

RATIOS IN WHICH NITROGENOUS MATTER OR ASH ARE CONCERNED.—Any ratio in which either the percentage of nitrogenous matter or of ash is one factor, shows wide variations. These variations are especially conspicuous in ratios between either one of these components and any one of the other components whose percentage runs high—as water, starch, or total carbohydrates. Such ratios bear no resemblance to a constant.

An effort to discover a possible constant ratio between the ash content of potatoes and their nitrogenous-matter content (letting the percentage of ash equal 1) resulted in the following:

ASH %: NITROGENOUS MATTER % : : 1 : x

IRRIGATED POTATOES

(Table VII) GROWER	RATIO	(Table VIII) LOCALITY	RATIO	(Table IX) VARIETY	RATIO
I	1:1.481	Carbondale	1:2.359	Blue Victor	1:1.388
III	1:1.818	Divide	1:2.308	Brown Beauty	1:1.643
IV	1:2.678	Greeley	1:2.494	Burbank	1:2.027
V	1:2.260	San Luis Valley	1:1.481	Cobbler	1:2.150
VI	1:2.442			Downing	1:3.077
VII	1:1.795			Gold Coin	1:2.384
VIII	1:2.142			Ohio	1:2.681
IX	1:2.512			Peach Blow	1:2.049
X	1:2.368			Pearl	1:2.232
XI	1:2.778			Rural	1:1.896
				Triumph	1:3.038
Avg. Ratio	1:2.136		1:2.136		1:2.136

DRYLAND POTATOES

XII	1:2.235	Briggsdale	1:2.149	5 Varieties	1:1.810-1:2.494
XIII	1:1.893				
Avg.	1:2.149		1:2.149		1:2.149

The variations in these ratios are very wide; among irrigated potatoes according to growers from 1:1.481 to 1:2.778—a difference of 90%; according to locality from 1:1.481 to 1:2.494—a difference of 70%; according to variety from 1:1.388 to 1:3.077—a difference of 125%. Such extreme variations cannot be considered as constants. That their final averages for the irrigated and dryland potatoes are nearly identical—1:2.136 and 1:2.149 respectively—is probably a coincidence.

The percentage of nitrogenous matter and the percentage of ash found in the potato apparently depend upon the food accessible to the plant; hence, the wide percentage-differences (see p. 13) that occur in the individual tubers, and the final lack of a constant ratio between their total averages.

In the light of this lack of a constant ratio between the nitrogenous matter and ash percentages, it seemed desirable to discover whether or not the sum of the percentages of these two components approaches a constant in value. The results are as follows:

NITROGENOUS MATTER % + ASH %

IRRIGATED POTATOES

(Table VII) GROWER	SUM	(Table VIII) LOCALITY	SUM	(Table IX) VARIETY	SUM
I	2.472	Carbondale	3.072	Blue Victor	2.466
III	3.207	Divide	3.045	Brown Beauty	2.659
IV	3.230	Greeley	3.400	Burbank	2.841
V	3.056	San Luis Valley	2.472	Cobbler	2.868
VI	3.049			Downing	3.847
VII	3.025			Gold Coin	3.244
VIII	2.919			Ohio	3.596
IX	3.148			Peach Blow	2.701
X	3.118			Pearl	3.023
XI	3.601			Rural	3.032
				Triumph	3.011
	3.021		3.021		3.021

DRYLAND POTATOES

XII	3.460	Briggsdale	3.380	5 Varieties	2.910-3.380
XIII	3.137				
	3.380		3.380		3.380

It will be noted that the first column of these sums among the irrigated potatoes, exclusive of those of Growers I and XI, are fairly similar; in the second column the sums for Carbondale and the Divide are almost identical, but for Greeley and the San Luis Valley they vary much. It has already been pointed out that the potatoes of the Greeley District run particularly high in nitrogenous matter, while the potatoes of the San Luis Valley run particularly low in this component; these facts probably account for the larger sums which represent Grower XI and the Greeley District, and for the smaller sums which represent Grower I and the San Luis Valley; probably, too, these facts also account for the wide variations in the third column sums—2.466, Blue Victor raised in the San Luis Valley, to 3.847, Downing, raised in the Greeley District. Excluding these, however, there is yet little similarity in the sums representing the remaining varieties.

Hence, we can scarcely conclude that these sums of the percentages of nitrogenous matter and ash approach any constant in value. On the whole, these sums are nearly as far from a constant as are their ratios. Though it might be possible to assume that the sum representing a given locality is fairly constant for that locality; likewise possibly a sum representing a particular grower; yet no sum representing a variety could be considered constant since these varieties are usually the products of more than one locality and of more than one grower.

SOME APPLICATIONS OF APPROXIMATE CONSTANTS

Table X is a record of about fifty potatoes grown in the Greeley District in 1919. About two-thirds of these tubers (Part A) weighed more than 100 g. each, and the remainder (Part B) less. Water and dry-matter determinations only were carried out on these potatoes, and the percentages of these two components appear in light type in columns 7 and 8. The remaining percentages which appear in heavy type in columns 9-17, are calculated percentages, being simply the results of applications of the approximate constants discussed in the immediately preceding pages.

TOTAL CARBOHYDRATES CALCULATED. — The approximate constant ratios for the approximate calculation of total carbohydrates have been considered: One, the ratio

Total Carbohydrates % : Dry Matter % : : 1 : 1.15;

the other the very doubtful ratio

Total Carbohydrates %: Water % : : 1 : 3.90.

Reasons for the probable reliability of the former and unreliability of the latter have already been discussed (see pp. 26, 29).

Applications of these two methods for the determination of total carbohydrates give the results tabulated in columns 9 and 10 respectively. Tracing down column 9, it will be noted that as the percentage of dry matter increases, the percentage of total carbohydrates also increases. Such increases are what should be expected. Comparison of these calculated total carbohydrates percentages with the average of the same component in the Greeley District potatoes (see Table V) shows very fair agreement. Hence, it seems probable that these percentages calculated by application of the ratio 1:1.15 (total carbohydrates : dry matter) are approximately correct.

Tracing down column 10, it will be noted that as the percentage of water increases, the percentage of total carbohydrates also increases. Since such increases are contrary to fact, it follows that these individual percentages of total carbohydrates are very unreliable. For example, compare Nos. 120 and 131 whose water percentages are 73.34 and 82.55 respectively, and whose corresponding total carbohydrate percentages (18.81% and 21.17%) are manifestly absurd; total carbohydrates percentages vary *inversely* with water percentages, *not* directly. But the interesting fact about column 10 is, that in spite of such manifest absurdities, its total averages, both for the larger and the smaller potatoes (Parts A and B) are nearly identical with those of column 9; these being in column 9, 19.37% and 19.75%, and in column 10, 19.92% and 19.81%.

Hence, for large numbers of irrigated potatoes, the very doubtful ratio of 1:3.90 (total carbohydrates % : water %) seems to have a certain tentative value.

STARCH CALCULATED.—One approximate constant and three approximate ratios for the calculation of starch have been considered:

1. Dry matter % — 6.71 = Starch % (see p. 25).
2. Starch % : Dry Matter % : : 1 : 1.42 (see p. 26).
3. Starch % : Total Carbohydrates % : : 1 : 1.24 (see p. 27).
4. Starch % : Water % : : 1 : 4.82 (see p. 28).

Each of these ratios in turn was used for the calculation of the approximate percentages of starch; the results so obtained appear in columns 11, 12 and 13, and 14 respectively. For reasons already discussed, the figures in column 13 were derived from the total carbohydrates recorded in column 9, rather than in column 10. Careful scrutiny of columns 11, 12, 13 and 14, shows that columns 12 and 13 are nearly identical; that is, application of the ratio 1:1.42 (starch % : dry matter %), or of the ratio 1:1.24 (starch % : total carbohydrates %) gives the corresponding approximate percentages of starch in nearly identical percentages. Comparison of these calculated starch percentages with the average percentages of starch actually determined in 144 Greeley District potatoes (see Table V) shows very fair agreement. Hence, it seems probable that methods 2 and 3 (enumerated above) for calculating starch percentages of irrigated potatoes, are approximately correct.

That the percentages of total carbohydrates used in calculating column 13 were themselves approximate percentages, and that their use led to such probable starch percentages, helps to substantiate the value of the method by which they had been calculated (see p. 27).

Examination of column 11 shows that its percentages vary more from the corresponding percentages in columns 12 and 13 than these vary with each other. From the nature of the variable percentages which make up the constant 6.71 (see p. 25) this fact is not surprising. However, column 11 results seem to indicate that considerable confidence may be placed in the use of the approximate constant 6.71 for calculating the percentages of starch in irrigated potatoes.

Column 14 percentages show wider variations from the corresponding percentages in columns 12 and 13, and from the actual starch percentages of Greeley potatoes (Table V) than do the column 11 percentages. From the nature of the very doubtful ratio 1:4.82 (see p. 26) used in determining them, such variations are to be expected. However, that this doubtful ratio does have a certain tentative value, comparable perhaps with that of the doubtful ratio 1:3.90, is evidenced by the fact that the final averages of column 14, both for Part A and Part B, are not widely different from those of columns 11, 12 and 13; for all four columns these final averages are as follows:

Column	Part A	Part B
11	15.57%	16.00%
12	15.69%	15.99%
13	15.62%	15.92%
14	16.12%	16.03%

NITROGENOUS MATTER AND ASH CALCULATED.—To find the approximate sum of the percentages of these two components of potatoes, is a simple matter, if the percentages of dry matter and of total carbohydrates are known; obviously, the difference between the latter two equals the sum of the percentages of nitrogenous matter and ash (fat percentage being omitted, see p. 7). In column 15 such sums, thus determined, are recorded. It will be noted that their averages, 2.90 and 2.49 for Parts A and B respectively, are considerably lower than the corresponding total average for Greeley District potatoes, 3.40 (see p. 31; also Table VIII). Assuming, however, that in the percentages recorded in column 15, the percentages of ash and of nitrogenous matter co-exist in the proportions of 1 : 2.5 (the average ratio found between these two components in other Greeley District potatoes, assuming that ash = 1, p. 30), then application of this ratio leads directly to the approximate ash percentages recorded in column 16. Obviously, the approximate percentages of nitrogenous matter recorded in column 17 are readily calculated from the two preceding columns by difference.

Objections to the use of this ratio (1 : 2.5) on the ground that it is a purely local ratio is conceded. However, owing to the local variations in ash and nitrogenous-matter percentages already discussed (see p. 13), it is evident that only a local ratio for calculating even approximately these two percentages can be used. Comparison of the ash and nitrogenous-matter percentages recorded in columns 16 and 17, with corresponding Greeley District average percentages in Table V, shows that a reasonable proportional resemblance exists. This is not true, if the total average ratio 1 : 2.136, for all irrigated potatoes (see p. 30) be used.

OTHER APPLICATIONS OF APPROXIMATE CONSTANTS

Table XI is a record of twelve Burbank potatoes grown in the Carbondale District in 1923. In addition to water and dry-matter determinations, starch determinations also were carried out on these potatoes. The average percentages of these three components appear in light type in columns 7, 8 and 9. All other percentages are calculated approximate percentages; these appear in heavy type in columns 10-18.

Starch approximate percentages were calculated by the four methods previously used in Table X. In Table XI, however, we have the advantage of comparing these approximate percentages (columns 12, 13, 14 and 15) with starch percentages determined by analyses (column 9). It will readily be seen that the first

three methods give approximate results quite comparable with the actually determined percentages; also that the objections already urged to the fourth method are also perfectly valid in Table XI.

The sums of the nitrogenous-matter and ash percentages were determined in the same manner as in Table X; these are recorded in column 16. To separate the two, the average ratio of ash to nitrogenous matter as found in the Carbondale District potatoes, 1:2.36 (see p. 30) was used. The resulting approximate percentages of ash are recorded in column 17, and of nitrogenous matter in column 18.

In Table II (see p. 53), the incomplete ash record was calculated from the analytically determined nitrogenous-matter percentages by use of the ratio of ash to nitrogenous matter, 1:1.48, for San Luis Valley potatoes (see pp. 3 0and 34); while the incomplete starch record was calculated from the analytically determined dry-matter percentages by use of the average ratio of starch to dry matter, 1:1.42 (see pp. 26 and 33).

PERCENTAGE COMPOSITION OF CORTEX VS. MEDULLARY AREA

A number of investigators have determined the differences in percentage composition of the cortex, of the outer medullary area, and of the inner medullary area of potatoes.

Coudon and Boussard,[13] while studying potatoes raised in France, separated these three parts of the tubers and analyzed them separately. They found that the percentage of water increases from cortex to core (inner medullary area), the percentage of starch decreases, and the percentage of total nitrogen increases. They found, however, that the cortex is richer in protein nitrogen than the core. Frisbie and Bryant,[14] while studying the White Star variety of potato, separated the cortex from the medullary area, and analyzed the two parts separately. They got results directly opposed to those of Coudon and Boussard except that they also found the greater portion of the protein nitrogen in the cortex. These investigators also determined the percentages of ash and found the higher percentage of it in the cortex.

Waterstradt and Wilner[15] while studying potatoes raised in Germany, separated the cortex and medullary area and analyzed each. The trend of their dry-matter and starch results agreed with those of Coudon and Boussard; their total nitrogen results were very close, but in three groups out of four, these agreed with the results of the French investigators; the results of the fourth group were contradictory.

[13]Annales de la Societe Agronomique, 2 Ser. (1897).
[14]U. S. Dept. of Ag., O. E. S., Bul. 43 (1897).
[15]Bl. Gersten, Hoffen und Kartoffelbau 3 (1901).

East,[16] in his interesting study of potatoes, took two groups of tubers, Rural and Carman, separated the three parts, and analyzed each of the three for dry matter and for nitrogen. His dry-matter results from both groups corresponded to those of Coudon and Boussard, and to those of Waterstradt and Wilner. His total-nitrogen results, like those of the two latter investigators, were very close; on the fresh basis they contradicted each other, but on the dry basis they showed unmistakably that total nitrogen increases from cortex to core.

ANALYSES OF CORTEX AND MEDULLARY AREA. — In connection with the present research it seemed desirable to determine separately the percentage composition of the cortex and the medullary area of a few groups of potatoes. Three groups were chosen for such analyses: A, Burbanks, four, from Carbondale; B, Burbanks, four, from the San Luis Valley; C, Rurals, four, from the Greeley District.

As needed for analysis, each tuber was weighed; the thinnest possible peeling was removed and the cortex at once carefully separated from the medullary area, then each portion was weighed and ground promptly; on each, triplicate determinations for water, dry matter, starch, nitrogen and ash were carried out as heretofore described. From the data thus determined, the average percentage composition of the cortex and of the medullary area in turn were calculated, and finally the percentage composition of the whole potato; however, Nos. 499 and 502 represent direct analyses of whole potatoes, each of these being carried out on a lengthwise fraction of the tuber.

DISCUSSION OF RESULTS.—Table XII is the record of these cortex and medullary area analyses. In this table each group of potatoes is tabulated by itself—its cortices, its medullary areas and its corresponding whole tubers all being properly subgrouped and averaged. Careful scrutiny of each column of this table reveals the following facts:

a. The percentage of water in each cortex is less than in the corresponding medullary area.
b. The percentages of dry matter, starch, total carbohydrates and ash are each greater in the cortex than in the corresponding medullary area.
c. In each whole potato, the percentage of each of the five components—water, dry matter, starch, total carbohydrates and ash—lies between the corresponding percentages found in the cortex and medullary area.
d. The percentages of nitrogenous matter do not follow a delightful regularity like the preceding five components. The facts concerning this component are as follows:

[16]University of Illinois Station Bu' 127 (1905).

1. In Group A, the percentage of nitrogenous matter is less in each cortex than in the corresponding medullary area.
2. In Group B, the percentage of nitrogenous matter in the first two tubers, Nos. 516-517 and Nos. 519-520, is also less in each cortex than in the corresponding medullary area; in the other two tubers of the group, Nos. 510-511 and Nos. 513-514, the exact opposite is true.
3. In Group C, the percentage of nitrogenous matter in the first tuber, Nos. 526-527, is less in the cortex than in the medullary area; in the next two, Nos. 529-530 and Nos. 532-533, the percentage of nitrogenous matter in each cortex is practically identical with that of the corresponding cortex; in the last tuber, Nos. 535-536, the percentage of nitrogenous matter is greater in the cortex than in the corresponding medullary area.

Hence, in seven of the twelve potatoes recorded in Table XII, the percentage of nitrogenous matter increases from cortex to core; in two the percentages of nitrogenous matter in cortex and core are practically identical; in three the percentage of nitrogenous matter decreases from cortex to core.

This lack of regularity in the direction of increase or decrease of nitrogenous matter is similar to the results obtained by Waterstradt and Wilner, and by East. It seems not unlikely that such contradictory results are due to the lack of uniformity in the maturity of the potatoes analyzed. It is not improbable that the more mature the tuber, the more definitely will its total nitrogen content increase from cortex to core. The greater storage of starch in the cortex as the tuber matures would tend to this result.

PERCENTAGE COMPOSITION OF CORTICES AND MEDULLARY AREAS CALCULTED TO THE DRY BASIS.—East[17] has pointed out that when his contradictory nitrogen results are calculated to the dry basis, they show unmistakably that the percentage of total nitrogen increases from cortex to core. That statement of East applies exactly to the present cortex and medullary-area analyses. All analyses recorded in Table XII are on the fresh basis. These same analyses calculated to the dry basis are recorded in Table XIII. Careful examination of this table will show that the results may be thus summarized.

a. On the dry basis, the percentage of total nitrogenous matter is less in the cortex than in the medullary area.
b. On the dry basis, the percentage of ash is greater in the cortex than in the medullary area.

[17] University of Illinois Station Bul. 127 (1905).

c. On the dry basis, of twelve potatoes analyzed, in seven the percentage of starch is decidedly greater in the cortex than in the medullary area; in three (Nos. 500-501, 516-517, 535-536) the two percentages are nearly identical; in two (Nos. 519-520, 532-533) the percentage of starch is decidedly less in the cortex than in the medullary area.

d. On the dry basis, the percentage of total carbohydrates is greater in the cortex than in the medullary area.

COMPOSITION OF POTATOES ON THE DRY BASIS

The discussion so far, with the exception of that on Table XIII, has dealt with potato composition on the fresh basis. In this research all analytical results were also calculated to the dry basis. For further comparison the final averages of these results on the dry basis, are recorded in Tables XIV, XV and XVI, which correspond in arrangement to Tables IV, V and VI. For convenience, the average percentages of dry matter given in Tables IV, V and VI, are repeated in Tables XIV, XV and XVI. Also, in the latter tables are recorded the average percentages of nitrogen as well as of nitrogenous matter (Nitrogen × 6.25). Careful examination of these three tables shows clearly that even on the dry basis, the percentages of nitrogenous matter, ash, starch and total carbohydrates vary as widely in potatoes on the dry basis as on the fresh basis. There are no two potatoes identical in percentage composition either on the fresh or dry basis.

DRY BASIS APPROXIMATE CONSTANTS.—Exhaustive search for constants on the dry basis disclosed but one that seemed even approximately constant—the ratio between starch and dry matter. The averages of this ratio are tabulated in the last column of Tables XIV, XV and XVI. Examination of this column shows that this ratio is fairly constant in reference to the potatoes of different growers, of different localities, and of different varieties. It is nearly identical in its total averages for irrigated and dryland potatoes, being 1:1.249 and 1:1.263, respectively.

PERCENTAGE COMPOSITION OF RAW VS. COOKED POTATOES

In the course of this research, various comparisons were made of the analyses of raw potatoes with corresponding cooked ones. In the case of boiled and steamed potatoes, this was done usually by dividing a potato into lengthwise halves, then analysing one half raw, and the other half, cooked. Unsatisfactory as this method of comparison was—a method necessitating the exposure of the raw surface of the middle of the potato to the action of boiling water or steam—yet it was found to be much

more satisfactory than the alternative method of comparing the average analyses of whole cooked potatoes with the average percentage composition of a corresponding group of potatoes in Table I. Table XVII is the record of the comparative analyses of raw vs. cooked potatoes.

STUDY OF TABLE XVII.—Each cooked potato recorded in this table was allowed to cool to room temperature before its analysis was begun. Groups 1-6 record the average analyses of the raw lengthwise halves of tubers, while Groups 1a-6a record the average analyses of the corresponding halves, boiled. The halves composing Groups 1a-4a were allowed to cool unpeeled, while those composing 5a-6a were peeled hot, then cooled. The tubers, whole, composing Group 7 were boiled unpeeled, then peeled when cooked, but those composing Group 8 were peeled before boiling. The halves, composing Group 9, were boiled, while the other halves of the same tubers, composing Group 10, were steamed; both these groups were cooled unpeeled. The skins of the baked potatoes composing Group 11 were slit open as soon as done to allow the steam to escape, but potato 314, baked with potatoes 310-313, was cooled with the skin still intact.

POTATOES BOILED AND COOLED UNPEELED.—On comparing the average percentage compositions of Groups 1-4, raw, with those of the corresponding Groups 1a-4a, boiled and cooled unpeeled, it will be noted that the average percentages of water, dry matter, starch and total carbohydrates, do not vary greatly; these group averages are as follows:

Groups	Condition	Water %	Dry Matter %	Starch %	Total Carbohydrates %
1	Raw	75.76	24.24	16.27	21.00
1a	Boiled	75.87	24.13	16.34	21.07
2	Raw	73.74	26.26	19.21	23.19
2a	Boiled	74.87	25.12	18.89	22.34
3	Raw	76.57	23.43	16.10	20.04
3a	Boiled	76.54	23.46	16.25	20.27
4	Raw	74.87	25.13	16.99	21.52
4a	Boiled	74.67	25.33	17.04	21.91

Evidently, then, when an effort is made to prevent the steam from escaping from the boiled half-tubers by allowing them to cool unpeeled, there is little difference between the raw and the cooked lengthwise halves regarding these four components. Regarding the average percentages of the nitrogenous-matter and ash components, however, in these cooked half-tubers, there are losses in every group; the average percentages of these components with their approximate percentage losses are as follows:

Groups	Condition	Nitrogenous Matter %	Loss %	Ash %	Ash Loss %
1	Raw	2.335		0.902	
1a	Boiled	2.285	—2.0	.769	—15.0
2	Raw	2.100		.963	
2a	Boiled	1.987	—5.0	.789	—18.0
3	Raw	2.409		.984	
3a	Boiled	2.292	—5.0	.903	—8.0
4	Raw	2.579		1.034	
4a	Boiled	2.439	—5.0	.980	—5.0

It will be noted that the approximate percentage losses of ash are much higher than of the nitrogenous matter.

POTATOES BOILED AND PEELED WHILE HOT.—Comparison of Groups 5-6, raw, with Groups 5a-6a, peeled hot to allow moisture to escape, shows a different state of affairs regarding all components. These comparative group average percentages of water, dry matter, starch and total carbohydrates are as follows:

Groups	Condition	Water	Dry Matter	Starch	Total Carbohydrates
5	Raw	76.79	23.21	15.49	19.40
5a	Boiled	75.16	24.84	16.52	21.07
6	Raw	78.03	21.97	14.64	18.41
6a	Boiled	74.85	25.15	16.14	21.77

It will be noted that in the boiled potatoes (5a-6a) the average water percentages decrease considerably, and that simultaneously the average percentages of dry matter, starch and total carbohydrates increase accordingly; all these results are the obvious consequence of allowing the boiled potatoes to dry out as much as possible.

Comparative average percentages of nitrogenous matter and ash and their respective losses, are as follows:

		Nitrogenous Matter		Ash	
Groups	Condition	%	Loss %	%	Loss %
5	Raw	2.876		0.936	
5a	Boiled	2.830	—1.6	.881	—5.8
6	Raw	2.470		1.088	
6a	Boiled	2.543	+3.0	1.014	—6.8

Concerning the ash percentages, it will be noted that both groups of the cooked tubers, 5a and 6a, show an average percentage loss of 5.8% and 6.8% respectively, over the corresponding groups of raw tubers, 5 and 6, yet these percentage losses are not as high as in Groups 1-4a already discussed. Concerning the nitrogenous-matter percentages, Group 5a shows a loss over Group 5 of 1.6%, while Group 6a shows an actual gain of 3%; this gain is explained by the fact that Group 6a shows a much greater loss of water over Group 6 than does Group 5a over Group 5. Obviously, then, the partial escape of steam from the boiled half-tubers has caused an increase in ash and nitrogenous-matter average percentages, as well as in dry matter, starch, and total carbohydrates, over such percentages in the corresponding raw half-tubers.

WHOLE TUBERS BOILED.—Whole tubers, unpeeled and peeled before boiling, make up Groups 7 and 8 respectively; the tubers of the former group were peeled as soon as cooked. In any case, analyses of whole tubers are bound to be unsatisfactory because of the impossibility of comparison with identical whole raw tubers. The alternative is comparison of a like group of raw potatoes,—that is, potatoes from the same field. For that purpose, the average percentage composition of Group 25, Table I, is inserted in Table XVII following Groups 7 and 8. It will be noted that the average percentages of water, dry matter, starch and total carbohydrates do not differ greatly between these cooked and raw tubers. Greater comparative differences occur in their ash and nitrogenous-matter percentages. The higher average ash percentage in the raw group is in harmony with the fact that some mineral matter is lost from potatoes in the boiling process. But the lower average nitrogenous-matter percentage in the raw group is not in harmony with the fact that some nitrogenous matter, also, is lost during the boiling process. However, in Group 25 (Table I) several individual tubers have correspondingly high percentages of nitrogenous matter, and obviously, the tubers of Groups 7 and 8 are similar to those.

BOILED VS. STEAMED POTATOES.—Groups 9 and 10 are made up respectively of corresponding halves of the same tubers, Group 9 having been boiled in the skins, and Group 10 steamed. Comparison of the average percentage compositions of these two groups shows that the steamed potatoes are slightly drier than the boiled, and that they have a slightly higher percentage of each of the other components, including ash and nitrogenous matter; concerning these last two components, it will be noted that the percentages of both these are higher proportionally than any of the other components. Hence, it appears that steaming potatoes extracts less of their ash and nitrogenous matter than boiling.

BAKED POTATOES.—Baked potatoes, according to the best household practice, have their skins slit open the moment they are done, to allow moisture to escape. Vindication of this practice is furnished in Groups 11 and 12. All these potatoes were baked together, the four of Group 11 being treated as indicated above, but the one of Group 12 being allowed to cool with its skin intact. For purposes of comparison, the average percentage composition of the fourteen raw potatoes (Group 28, Table I) from the same field, follow Group 12. It will be noted that the potatoes of Group 11 have lost a large percentage of water, while the average percentages of the other components have risen more or less; also that the percentage composition of the one tuber of Group 12 approximates fairly closely, except in its high starch content, the average percentage composition of Group 28, Table I.

For discussion of the principles of potato cookery, see Colorado Experiment Station Bulletin No. 297, Potatoes from the Housekeeper's Standpoint.

SUMMARY

1. No two potatoes of identical composition were found in the same variety, or in the same group, or even in the same hill.
2. The size of a potato is no criterion of its maturity.
3. Potatoes which have had the longest growing season are the most mature.
4. The percentage of dry matter in potatoes varies inversely with the percentage of water; in general, the percentage of starch and of total carbohydrates vary likewise.
5. There seems to be little relationship between the nitrogenous-matter and ash percentages in potatoes; any relationship observed seems to be purely local.
6. "There does not seem to be any relation existing between the amount of water received and the amount of moisture in the potato."[18]
7. The quality of potatoes seems to depend more upon grower, soil, and season than upon variety.
8. In irrigated potatoes, the percentage of dry matter less 6.71 gives an approximation of the percentage of starch. Very wide variations, depending upon grower, locality, and variety of potato, exist in this possible constant.
9. Among irrigated potatoes, the following approximate ratios seem to hold:
   Starch % : Dry Matter % : : 1:1.42
   Total Carbohydrates % : Dry Matter % : : 1:1.15
   Starch % : Total Carbohydrates % : : 1:1.24
   Starch % : Water % : : 1:5 (wide approximation)
   Total Carbohydrates % : Water % : : 1:3.897 (wide approximation).
10. In potatoes the percentage of water in the cortex is less than in the corresponding medullary area, while the percentages of dry matter, starch, total carbohydrates and ash are each greater.
11. On the fresh basis, the percentages of nitrogenous matter do not follow any uniform law; but on dry basis, the percentage of total nitrogenous matter is less in the cortex than in the corresponding medullary area.
12. In general, the composition of potatoes on the dry basis shows as little uniformity as on the fresh basis.
13. On the dry basis, one constant seems to hold:
    Starch % : Dry Matter % : : 1:1.25.

[18] Richman, Utah Expt. Sta. Bul. 5 (1891).

14. Boiled lengthwise halves of potatoes cooled unpeeled, show nearly the same content of water, dry matter, starch and total carbohydrates as their corresponding raw halves, but a less content of nitrogenous matter and ash; peeled hot, then cooled, they show a less content of water and a correspondingly greater content of dry matter, starch and total carbohydrates than their corresponding raw halves; also they show a greater proportional content of nitrogenous matter and ash than the halves peeled uncooled.
15. Steamed lengthwise halves of potatoes show a less content of water than their corresponding raw halves, and consequently a greater content of dry matter, starch, total carbohydrates, nitrogenous matter and ash. Steaming potatoes extracts less of their nitrogenous matter and ash than boiling.
16. Analyses of whole boiled potatoes, which can only be compared with analyses of corresponding groups of potatoes, are unsatisfactory.
17. Baked potatoes should have their skins slit open the moment they are done. The loss of water which results, increases their content of dry matter, starch, total carbohydates, nitrogenous matter and ash.

TABLE I

Chemical Composition of Potatoes above 100 grams (3½ oz.) in Weight Arranged with Special Regard to Grower and Year.

Part A, Irrigated Potatoes

Grower	Year	Variety of Potato; Locality Where Grown	No. of Tuber Analyzed	No. of Hill	Weight		Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by dif.)
					Grams	Ounces	%	%	%	%	%	%
		Group 1										
I	'19	Brown Beauty San Luis Valley	53	I	275	9.7	76.81	23.19	1.104	.819	17.34	21.26
			54	I	110	3.8	81.85	18.15	1.349	.694	12.32	16.12
			57	III	245	8.6	75.70	24.30	1.435	1.021	18.22	21.84
			58	III	237	8.3	74.47	25.53	1.223	1.067	20.23	23.24
			59	III	136	4.8	72.41	27.59	1.261	1.071	21.61	25.26
			60	III	134	4.7	74.04	25.96	1.489	1.039	19.92	23.43
			61	III	123	4.4	75.25	24.75	1.509	1.051	18.33	22.19
			63	IV	218	7.7	78.58	21.42	1.508	1.005	16.04	18.90
			64	IV	134	4.7	78.69	21.31	1.439	.952	16.05	18.92
I	'19	Do.	9 Tu	bers,	av. co	mp'n	76.31	23.69	1.368	.968	17.78	21.24
		Group 2										
I	'19	Burbank San Luis Valley	66	I	217	7.6	75.99	24.01	1.452	1.052	17.68	21.50
			67	I	132	4.6	75.57	24.43	1.433	.986	17.97	22.01
			68	I	104	3.6	74.78	25.22	1.282	.991	18.89	22.94
			72	II	241	8.5	78.49	21.51	1.512	1.004	15.46	18.99
			73	II	237	8.3	77.75	22.25	1.514	1.040	15.78	19.69
			74	II	144	5.0	75.89	24.11	1.417	.965	17.12	21.73
			75	II	132	4.7	76.22	23.78	1.549	1.054	17.17	21.17
			80	III	250	8.8	76.85	23.15	1.340	1.038	17.27	20.77
			81	III	226	7.9	77.29	22.71	1.400	.984	17.35	20.32
			82	III	103	3.6	77.86	22.14	1.696	.997	15.33	19.44
			83	IV	212	7.4	77.06	22.94	1.471	1.031	16.59	20.44
			84	IV	164	5.8	78.35	21.65	1.349	.902	16.08	19.39
			88	V	164	5.8	79.27	20.73	1.535	.933	14.37	18.26
			89	V	153	5.5	76.60	23.40	1.337	.995	17.39	21.06
			90	V	119	4.2	74.64	25.36	1.349	1.073	19.33	22.94
			91	V	116	4.0	77.46	22.54	1.499	.922	16.08	20.19
			95	VI	199	7.0	76.30	23.70	1.520	.998	17.79	21.18
			96	VI	198	7.0	76.59	23.41	1.390	.939	17.40	21.08
I	'19	Do.	18 Tu	bers,	av. co	mp'n	76.81	23.19	1.447	.995	16.94	20.74
		Group 3										
I	'19	Pearl San Luis Valley	1	IV	255	9.0	79.58	20.42	1.046	.823	14.87	18.55
			2	IV	122	4.3	76.39	23.61	1.232	.931	17.22	21.44
			4	V	196	7.0	76.82	23.18	1.316	.880	17.84	20.98
			7	VI	234	8.8	76.87	23.13	1.278	.925	18.41	20.92
			8	VI	213	7.5	77.13	22.87	1.351	.877	17.77	20.66
			13	VII	397	14.3	75.63	24.37	1.300	.854	19.53	22.21
			14	VII	341	12.1	75.43	24.57	1.403	.854	19.62	22.31
			18	VIII	467	16.5	76.77	23.23	1.195	.908	18.42	21.12
			19	VIII	225	7.9	77.38	22.62	1.317	.935	17.70	20.36
			20	VIII	173	6.1	76.04	23.96	1.288	.945	18.77	21.73
			21	VIII	165	5.8	76.72	23.28	1.331	.983	17.86	20.96
			22	VIII	164	5.8	74.19	25.81	1.470	1.034	20.09	23.30
			23	VIII	125	4.4	74.18	25.82	1.162	1.054	19.61	23.60
I	'19	Do.	13 Tu	bers,	av. co	mp'n	76.39	23.61	1.287	.911	18.28	21.42
		Group 4										
	'19	Rural San Luis Valley	24	I	198	7.0	72.95	27.05	1.430	1.032	21.47	24.58
			28	II	292	10.3	73.09	26.91	1.394	1.109	21.15	24.49
			29	II	182	6.4	72.61	27.39	1.431	1.143	21.78	24.81
			31	III	309	10.9	75.64	24.36	1.112	1.039	18.72	22.21
			32	III	174	6.1	74.21	25.79	1.265	1.051	20.33	23.47
			36	IV	287	10.1	75.31	24.69	1.102	1.155	19.09	22.33
			37	IV	132	4.7	73.33	27.67	.928	1.520	21.16	25.24
			38	IV	128	4.5	72.76	27.24	.868	1.084	21.81	24.18
			39	IV	107	3.7	74.90	25.10	1.344	1.006	19.28	22.75
			42	VI	181	6.4	75.59	24.41	1.278	1.106	18.44	22.02
			43	VI	152	5.3	75.37	24.63	1.292	1.004	19.40	22.33
			44	VI	148	5.2	75.77	24.23	1.267	1.001	18.17	21.96
I	'19	Do.	12 Tu	bers,	av. co	mp'n	74.29	25.71	1.226	1.104	20.53	23.30
I	'19	**Total:**	**52 Tu**	**bers,**	**av. co**	**mp'n**	**76.42**	**23.58**	**1.342**	**1.032**	**18.68**	**21.20**

TABLE I, Part A—Continued

Grower	Year	Variety of Potato; Locality Where Grown	No. of Tuber Analyzed	No. of Hill	Weight		Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by dif.)
					Grams	Ounces	%	%	%	%	%	%
		Group 5										
I	'20	Brown Beauty	165	I	171	6.1	79.07	20.93	1.816	1.055	15.07	18.06
		San Luis Valley	166	V	459	16.2	81.06	18.94	1.949	.910	13.18	16.08
			167	V	215	7.3	77.49	22.51	1.731	.942	14.40	19.83
			168	VII	277	9.9	83.13	16.87	1.569	.794	11.72	14.51
			169	VII	278	9.9	82.04	17.96	1.521	.926	12.18	15.51
			170	VIII	139	4.9	79.32	20.68	1.661	1.011	14.27	18.00
I	'20	Do.	6 Tubers, av. co				mp'n	80.35	19.65	1.708	.943	13.47	17.00
		Group 6										
I	'20	Burbank	171	X	253	9.0	75.90	24.10	1.711	1.014	14.60	21.37
		San Luis Valley	172	X	248	8.8	77.48	22.52	1.667	.999	14.04	19.85
			173	X	220	7.7	78.66	21.34	1.629	.850	14.26	18.86
			174	X	208	7.3	78.38	21.62	1.547	.968	14.08	19.10
			175	VII	281	9.9	79.75	20.25	1.724	.923	14.16	17.60
			176	VII	356	12.5	78.46	21.54	1.546	.899	14.52	19.09
I	'20	Do.	6 Tubers, av. co				mp'n	78.12	21.88	1.653	.944	14.27	19.30
		Group 7										
I	'20	Pearl	153	III	276	9.8	81.72	18.28	1.583	.793	12.75	15.90
		San Luis Valley	154	III	171	6.1	78.70	21.30	1.590	1.186	15.25	18.52
			155	IV	304	10.8	81.21	18.79	1.811	.872	13.62	16.10
			156	IV	193	6.9	79.26	20.74	1.764	9.65	14.89	18.01
			157	VI	202	7.1	79.48	20.52	1.341	1.016	14.56	18.16
			158	VI	199	7.0	79.12	20.88	1.273	.983	14.40	18.62
I	'20	Do.	6 Tubers, av. co				mp'n	79.91	20.09	1.560	.969	14.24	17.56
		Group 8										
I	'20	Rural	159	I	265	9.4	78.34	21.66	1.634	1.078	15.21	18.94
		San Luis Valley	160	I	265	9.4	78.64	21.36	1.511	.980	15.61	18.86
			161	II	356	12.7	79.57	20.43	1.504	.964	16.00	17.96
			162	II	312	11.1	78.78	21.22	1.503	.965	15.44	18.75
I	'20	Do.	4 Tubers, av. co				mp'n	78.84	21.16	1.538	.997	15.57	18.63
I	'20	**Total:**	22 Tubers, av. co				mp'n	79.34	20.66	1.622	.960	14.27	18.08
		Group 9										
I	'21	Blue Victor	342	....	349	12.3	78.54	21.46	1.266	.964	14.49	19.23
		San Luis Valley	343	....	310	10.9	72.95	27.05	1.794	1.256	19.35	24.00
			344	....	305	10.7	79.22	20.78	1.487	.990	13.63	18.30
			339	....	265	9.3	78.52	21.48	1.342	1.017	15.15	19.12
			340	....	256	9.0	78.00	22.00	1.472	.977	15.39	19.55
			341	....	232	8.2	77.49	22.51	1.231	.986	16.42	20.29
I	'21	Do.	6 Tubers, av. co				mp'n	77.45	22.55	1.432	1.032	15.74	20.07
		Group 10										
I	'21	Brown Beauty	415	....	287	10.2	74.94	25.06	1.184	1.015	17.74	22.86
		San Luis Valley	416	....	254	8.9	76.05	23.95	1.769	1.071	16.67	21.12
			417	....	238	8.4	73.65	26.35	1.310	1.050	19.23	23.99
			418	....	233	8.2	76.12	23.88	1.243	1.027	16.93	21.61
I	'21	Do.	4 Tubers, av. co				mp'n	75.19	24.81	1.383	1.054	17.64	22.37
		Group 11										
I	'21	Burbank	324	....	385	13.6	77.83	22.17	1.781	.965	15.55	19.42
		San Luis Valley	325	....	372	13.1	76.21	23.79	2.248	1.029	15.88	20.51
			326	....	347	12.2	78.82	21.18	2.156	.913	14.47	18.11
			327	....	317	11.2	73.59	26.41	1.601	1.065	18.09	23.74
			328	....	301	10.6	78.15	21.85	2.395	1.020	14.50	18.33
			329	....	257	9.0	78.57	21.43	1.871	.886	14.35	18.67
			330	....	243	8.5	76.43	23.57	1.339	1.101	17.58	21.13
			331	....	234	8.2	75.14	24.86	1.433	1.004	17.36	22.43
			332	....	173	6.1	74.61	25.39	1.390	1.097	17.46	22.90
I	'21	Do.	9 Tubers, av. co				mp'n	76.60	23.40	1.801	1.008	16.13	20.59

TABLE I, Part A—Continued

Grower	Year	Variety of Potato: Locality Where Grown	No. of Tuber Analyzed	No. of Hill	Weight		Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by diff.)
					Grams	Ounces	%	%	%	%	%	%
I	'21	**Group 12** Cobbler San Luis Valley	333	....	344	12.1	77.47	22.53	.902	.937	16.45	20.69
			334	....	341	12.0	77.84	22.16	.883	.899	15.40	20.37
			335	....	271	9.5	75.61	24.39	1.077	.933	16.76	22.38
			356	....	303	10.7	77.69	22.31	1.113	.810	15.27	20.28
			357	....	292	10.3	78.60	21.40	1.035	.919	15.01	19.44
			358	....	249	8.7	77.36	22.64	1.147	.959	16.47	20.53
I	'21	Do.	6 Tu	bers,	av. co	mp'n	77.45	22.55	1.026	.910	15.89	20.55
I	'21	**Group 13** Peach Blow San Luis Valley	277	....	349	12.3	79.21	20.79	1.475	.965	15.65	18.44
			278	....	323	11.4	80.08	19.92	1.413	.953	13.88	17.55
			279	....	282	9.9	78.32	21.68	1.390	.972	16.67	19.31
I	'21	Do.	3 Tu	bers,	av. co	mp'n	79.20	20.80	1.426	.963	15.40	18.40
I	**'21**	**Total:**	**28 Tu**	**bers,**	**av. co**	**mp'n**	77.04	22.96	1.813	.994	16.13	20.16
I	'22	**Group 14** Burbank San Luis Valley	512	....	432	15.2	75.86	24.14	2.243	.941	16.84	20.95
			515	....	385	13.6	75.84	24.16	2.086	.868	17.51	21.20
			518	....	327	11.5	77.30	22.70	2.326	.877	16.30	19.49
			521	....	325	11.4	74.68	25.32	2.138	.930	19.60	22.25
I	'22	Do.	4 Tu	bers,	av. co	mp'n	75.92	24.08	2.198	.904	17.56	20.97
I	**'19-**	**'22, Total:**	**106 T**	**ubers**	**av.co**	**mp'n**	**76.87**	**23.13**	**1.462**	**1.002**	**16.84**	**20.66**
III	'20	**Group 15** Brown Beauty Greeley	235	....	163	5.7	76.99	23.01	2.520	1.126	15.15	18.57
			236	....	178	6.2	75.49	24.51	2.319	1.072	15.62	21.12
			237	....	187	6.6	79.89	20.11	2.247	.991	14.20	16.87
			238	....	145	5.1	79.71	20.29	2.328	.904	13.52	17.05
			239	....	157	5.5	77.60	22.40	2.149	1.070	15.24	19.18
			240	....	153	5.4	77.00	23.00	2.159	1.093	15.63	19.75
III	'20	Do.	6 Tu	bers,	av. co	mp'n	77.78	22.22	2.287	1.032	14.89	19.90
III	'20	**Group 16** Burbank Greeley	214	....	220	7.7	79.13	20.87	2.193	1.062	14.22	17.61
			215	....	186	6.5	79.78	20.22	2.156	.964	13.57	17.10
			216	....	181	6.4	79.62	20.38	2.013	1.004	13.20	17.36
			217	....	156	5.5	78.91	21.09	2.359	.734	14.07	17.99
			218	....	138	4.8	76.15	23.85	2.000	1.027	17.82	20.82
			219	....	130	4.5	76.93	23.07	2.148	.803	16.97	20.12
III	'20	Do.	6 Tu	bers,	av. co	mp'n	78.42	21.58	2.129	.932	14.97	18.56
III	'20	**Group 17** Pearl Greeley	196	....	308	10.8	78.71	21.29	2.522	.899	15.04	17.86
			197	....	302	10.6	79.38	20.62	2.728	.982	13.56	17.91
			198	....	300	10.6	77.20	22.80	2.174	.970	15.38	19.65
			199	....	237	8.3	79.38	20.62	2.583	1.013	13.90	17.02
			200	....	218	7.7	79.95	20.05	2.292	.869	13.20	16.88
			201	....	197	6.9	80.36	19.64	2.099	.814	14.48	15.72
III	'20	Do.	6 Tu	bers,	av. co	mp'n	79.16	20.84	2.400	.925	14.22	17.67
III	'20	**Group 18** Rural Greeley	208	....	438	15.4	80.47	19.53	1.942	1.046	14.08	16.54
			209	....	307	10.8	78.23	21.77	2.185	.993	15.13	18.59
			210	....	312	11.0	78.24	21.76	2.126	1.042	15.60	18.59
			211	....	270	9.5	80.25	19.75	1.961	.918	14.75	16.87
			212	....	354	12.5	78.15	21.85	2.338	1.043	14.72	18.47
			213	....	259	9.1	78.74	21.26	2.283	.922	14.51	18.05
III	'20	Do.	6 Tu	bers,	av. co	mp'n	79.02	20.98	2.141	.983	14.80	17.85
III	**'20**	**Total:**	**24 Tu**	**bers,**	**av. co**	**mp'n**	**78.59**	**21.41**	**2.239**	**.968**	**14.72**	**18.10**
IV	'20	**Group 19** Cobbler Greeley	253	....	457	16.1	77.35	22.65	2.656	.992	15.49	19.02
			254	....	341	12.0	77.32	22.68	2.593	.997	16.35	19.09
			255	....	296	10.4	75.18	24.82	2.569	.905	18.61	21.44
			256	....	286	10.1	75.93	24.09	2.495	.960	17.72	20.61
			257	....	265	9.3	75.21	24.79	2.226	.984	17.57	21.58
			258	....	188	6.6	78.49	21.51	2.564	.869	14.88	18.07
IV	'20	Do.	6 Tu	bers,	av. co	mp'n	76.58	23.42	2.517	.947	16.77	19.95

TABLE I, Part A—Continued

Grower	Year	Variety of Potato; Locality Where Grown	No. of Tuber Analyzed	No. of Hill	Weight		Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by dif.)
					Grams	Ounces	%	%	%	%	%	%
IV	'20	**Group 20**										
		Ohio	229	....	306	10.8	80.05	19.95	2.144	.709	14.01	17.09
		Greeley	230	....	277	9.7	81.16	18.84	2.304	.632	14.80	15.90
			231	....	265	9.3	76.24	23.76	2.765	1.195	17.36	19.80
			232	....	216	7.6	75.76	24.24	2.622	.569	17.46	21.05
			233	....	211	7.4	77.43	22.57	2.383	.791	16.90	19.39
			234	....	205	7.2	77.40	22.60	2.274	.990	16.58	19.34
IV	'20	Do.	6 Tubers,		av. co	mp'n	78.00	22.00	2.415	.815	16.18	18.77
IV	'20	**Group 21**										
		Peach Blow	177	....	355	12.5	77.64	22.36	2.202	.935	16.32	19.12
		Greeley	178	....	290	10.2	78.95	21.05	1.849	.872	16.12	18.33
			179	....	286	10.1	77.30	22.70	2.179	.941	15.79	19.58
			180	....	266	9.3	75.31	24.69	2.386	1.018	16.97	21.28
			181	....	235	8.3	79.55	20.45	1.929	.965	14.97	17.45
			182	....	186	6.5	79.06	20.94	2.165	.779	14.80	17.99
IV	'20	Do.	6 Tubers,		av. co	mp'n	77.97	22.03	2.118	.919	15.83	18.99
IV	'20	**Group 22**										
		Triumph	226	....	233	8.2	81.76	18.24	2.271	.786	12.30	15.18
			227	....	213	7.5	81.65	18.35	2.421	.791	13.15	15.13
			228	....	204	7.2	79.97	20.03	2.360	.734	14.45	16.93
IV	'20	Do.	3 Tubers,		av. co	mp'n	81.13	18.87	2.355	.782	13.30	15.75
IV	**'20**	**Total:**	**21 Tubers,**		**av. co**	**mp'n**	**78.03**	**21.97**	**2.351**	**.878**	**15.83**	**18.74**
V	'20	**Group 23**										
		Burbank	183	....	459	16.2	76.84	23.16	2.284	1.022	17.77	19.85
		Carbondale	184	....	426	15.0	77.04	22.96	1.963	.883	16.24	20.11
			186	....	364	12.8	75.41	24.59	1.976	1.033	18.00	21.58
			187	....	359	12.6	75.58	24.42	1.751	.847	15.72	21.82
			188	....	317	11.2	76.96	23.04	2.052	.946	16.42	20.04
			189	....	308	10.8	77.30	22.70	2.290	.854	16.76	19.55
V	'20	Do.	6 Tubers,		av. co	mp'n	76.52	23.48	2.053	.931	16.82	20.49
V	'21	**Group 24**										
		Burbank	315	....	757	26.7	75.68	24.32	2.259	.803	17.22	21.25
		Carbondale	316	....	664	23.4	76.75	23.25	2.271	.849	16.77	20.13
			317	....	590	20.8	72.83	27.17	2.559	.890	18.27	23.72
			318	....	575	20.3	73.95	26.05	2.253	.906	17.92	22.89
			321	....	550	19.4	73.43	26.57	2.631	.955	18.20	22.98
			319	....	502	17.7	74.50	25.50	2.202	.888	16.42	22.41
			320	....	486	17.1	70.92	29.08	2.507	.953	19.14	25.62
			322	....	395	13.9	74.03	25.97	2.212	.890	18.70	22.86
			323	....	318	11.2	75.51	24.49	2.118	.798	17.34	21.57
V	'21	Do.	9 Tubers,		av. co	mp'n	74.18	25.82	2.335	.882	17.78	22.60
V	'22	**Group 25**										
		Burbank	453	....	505	17.8	73.52	26.48	2.040	.934	19.42	23.50
		Carbondale	454	....	490	17.3	71.91	28.09	2.088	1.017	19.68	24.98
			455	....	487	17.2	75.78	24.22	2.183	.939	18.54	21.09
			499	....	344	12.1	73.75	26.25	2.034	.952	19.38	23.26
			502	....	343	12.1	73.73	26.27	2.343	.926	18.66	23.00
			506	....	239	8.4	73.49	26.51	2.260	.893	19.52	23.35
			509	....	230	8.1	73.39	26.61	1.982	.946	18.27	23.68
			459	....	133	4.7	75.50	24.50	1.701	1.156	17.28	21.64
			460	....	133	4.7	73.84	26.16	1.541	1.025	19.43	23.59
			461	....	127	4.4	72.85	27.15	1.468	1.102	19.27	24.58
V	'22	Do.	10 Tubers,		av. co	mp'n	73.77	26.23	1.964	.989	18.94	23.27
V	'22	**Group 26**										
		Cobbler	462	....	184	6.5	76.60	23.40	2.272	.906	16.34	20.22
		Carbondale	463	....	167	5.9	75.25	74.75	2.181	.983	17.87	21.58
			464	....	149	5.2	75.04	24.96	1.928	.954	17.91	22.07
V	'22	Do.	3 Tubers,		av. co	mp'n	75.63	24.37	2.127	.948	17.38	21.29
V	'22	**Total:**	**13 Tubers,**		**av. co**	**mp'n**	**74.20**	**25.80**	**2.001**	**.980**	**18.58**	**22.82**
V	'20-'22,	**Total:**	**28 Tubers,**		**av. co**	**mp'n**	**74.69**	**25.31**	**2.119**	**.938**	**17.94**	**22.25**

TABLE I, Part A—Continued

Grower	Year	Variety of Potato; Locality Where Grown	No. of Tuber Analyzed	No. of Hill	Weight		Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (As Glu.)
					Grams	Ounces	%	%	%	%	%	%
VIII	'21	**Group 27** Burbank Carbondale	289	....	821	29.0	78.04	21.96	2.028	.955	14.67	18.96
			290	....	690	24.3	77.72	22.28	2.229	.840	15.03	19.21
			291	....	527	18.6	77.28	22.72	2.056	.915	15.53	19.74
			292	....	331	11.6	75.04	24.86	1.677	1.029	16.98	22.04
			293	....	314	11.0	76.00	24.00	1.944	1.022	16.60	21.63
			294	....	210	7.4	74.17	25.83	1.998	1.025	17.45	22.80
VIII	'21	Do.	6 Tubers,		av. co	mp'n	76.57	23.63	1.990	.929	16.04	20.71
IX	'21	**Group 28** Burbank Carbondale	301	....	605	21.3	74.20	25.80	2.430	.873	16.45	22.49
			303	....	490	17.3	79.03	20.97	2.124	.915	14.07	17.92
			304	....	444	15.6	76.91	23.07	2.013	.818	15.43	20.25
			305	....	432	15.2	75.31	24.69	2.248	.970	16.16	21.17
			306	....	387	13.6	74.81	25.19	2.273	.885	15.65	22.03
			307	....	321	11.6	75.93	24.07	2.010	.766	15.44	21.29
			308	....	290	10.2	77.30	22.70	2.060	.710	15.95	19.29
			309	....	289	10.2	78.19	21.81	2.171	.753	15.51	18.88
			403	....	470	16.6	77.08	22.92	2.206	.796	15.60	19.93
			404	....	377	13.3	74.65	25.35	2.502	.900	16.89	21.94
			405	....	353	12.4	76.43	23.57	2.422	.824	16.03	20.32
			406	....	332	12.0	75.54	24.46	2.269	1.004	16.49	21.18
			407	....	327	11.5	76.63	23.37	2.353	.890	15.60	20.12
			408	....	263	9.2	74.43	25.57	2.217	.995	17.00	22.35
IX	'21	Do.	14 Tubers,		av. co	mp'n	76.17	23.83	2.236	.864	15.87	20.72
IX	'21	**Group 29** Gold Coin Carbondale	245	....	420	14.8	72.06	27.94	2.190	.996	20.41	24.75
			246	....	290	10.2	73.74	26.26	2.234	1.061	17.06	22.96
			247	....	281	9.9	72.65	27.35	1.926	1.200	19.12	24.22
			249	....	252	8.9	72.56	27.44	2.402	.925	17.77	24.13
			250	....	241	8.5	73.16	26.84	2.529	.883	18.18	23.43
			251	....	205	7.2	72.00	28.00	2.524	.870	18.38	24.60
			248	....	187	6.6	74.66	25.34	2.236	.907	17.72	22.19
			252	....	153	5.4	72.75	27.25	2.236	.826	19.32	24.18
IX	'21	Do.	8 Tubers,		av. co	mp'n	72.95	27.05	2.286	.958	18.60	23.80
IX	**'21**	**Total:**	**22 Tubers,**		**av. co**	**mp'n**	**74.77**	**25.23**	**2.254**	**.894**	**16.86**	**21.66**
VI	'20	**Group 30** Cobbler Divide	241	....	261	9.2	79.75	20.25	2.324	.695	13.97	17.23
			242	....	239	8.4	77.81	22.19	2.268	.961	15.58	18.96
			243	....	231	8.1	77.89	20.11	1.476	.789	14.78	17.85
			244	....	198	7.0	75.94	24.06	1.498	.733	17.11	21.82
			245	....	181	6.5	75.76	24.24	2.202	.846	16.69	21.13
			246	....	178	6.2	77.63	22.37	2.173	.968	16.00	19.23
VI	'20	Do.	6 Tubers,		av. co	mp'n	77.77	22.23	2.023	.805	15.65	19.40
VI	'20	**Group 31** Ohio Divide	247	....	262	9.2	78.80	21.20	2.703	1.095	14.02	17.40
			249	....	222	7.8	78.41	21.59	2.958	1.095	15.97	17.43
			250	....	206	7.2	76.14	23.86	3.120	1.077	16.86	18.27
			251	....	232	8.1	77.26	22.74	2.547	1.110	16.60	18.98
			252	....	200	7.0	77.14	22.86	2.759	.918	16.70	19.20
VI	'20	Do.	5 Tubers,		av. co	mp'n	77.57	22.43	2.813	1.059	16.03	18.55
VI	'21	**Group 32** Peach Blow Divide	220	....	282	9.9	80.15	19.85	1.442	.725	15.02	17.67
			221	....	196	7.0	80.45	19.55	1.586	.825	14.00	17.13
			222	....	225	8.3	81.79	18.21	1.443	.877	13.09	15.88
			223	....	186	6.5	80.14	19.86	1.416	.916	13.88	17.52
			224	....	271	9.5	81.24	18.76	1.677	.632	13.76	16.81
			225	....	204	7.2	81.56	18.44	1.571	.728	13.43	16.14
VI	'20	Do.	6 Tubers,		av. co	mp'n	80.88	19.12	1.519	.785	13.87	16.81
VI	'21	**Group 33** Pearl Divide	202	I	394	13.9	83.19	16.81	1.821	.830	11.35	14.15
			203	I	272	9.3	83.31	16.69	1.817	.937	11.46	13.93
			204	I	250	8.8	82.85	17.15	1.950	.802	11.56	14.39
			205	....	249	12.3	78.98	21.02	1.923	.983	14.40	18.11
			206	....	198	7.0	76.84	23.16	2.713	.978	15.47	19.46
			207	....	189	6.6	86.23	23.27	2.362	.901	15.83	20.50
VI	'20	Do.	6 Tubers,		av. co	mp'n	80.23	19.77	2.097	.905	13.35	16.76

TABLE I, Part A—Continued

Grower	Year	Variety of Potato; Locality Where Grown	No. of Tuber Analyzed	No. of Hill	Weight		Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by dif.)
					Grams	Ounces	%	%	%	%	%	%
VI	'20	**Group 34** Triumph Divide	259	.....	287	10.2	80.96	19.04	2.132	.691	13.45	16.21
			260	.....	187	6.6	83.02	16.98	2.198	.770	12.44	14.01
			261	.....	181	6.5	82.77	17.23	2.197	.666	12.71	14.36
VI	'20	Do.	3 Tubers,		av. co	mp'n	82.25	17.75	2.176	.709	12.87	14.86
VI	**'20**	**Total:**	**26 Tubers,**		**av. co**	**mp'n**	**79.46**	**20.54**	**2.120**	**.868**	**14.52**	**17.55**
VII	'20	**Group 35** Burbank Divide	190	.....	290	10.2	76.80	23.20	1.999	.896	15.71	20.30
			191	.....	183	6.4	76.88	23.12	1.886	.965	16.65	20.26
			192	.....	169	5.9	77.47	22.53	2.128	1.080	16.55	19.32
			193	.....	165	5.8	76.36	23.64	1.950	1.230	17.50	20.46
			194	.....	165	5.8	75.60	24.40	1.696	1.070	18.10	21.63
			195	.....	166	5.8	76.81	23.19	2.000	1.254	16.66	19.93
VII	'20	Do.	6 Tubers,		av. co	mp'n	76.65	23.35	1.943	1.082	16.70	20.32
X	'21	**Group 36** Burbank Greeley	295	.....	208	7.3	79.13	20.87	2.061	.970	14.85	17.84
			296	.....	150	5.3	79.41	20.86	1.625	.940	15.05	18.29
			297	.....	140	4.9	78.46	21.54	1.434	.930	14.57	19.17
			298	.....	298	10.5	78.93	21.07	1.923	.848	14.25	18.30
			299	.....	238	8.4	78.77	21.23	1.876	.836	13.62	18.51
			300	.....	170	6.0	78.74	21.26	1.819	.824	14.34	18.61
X	'21	Do.	6 Tubers,		av. co	mp'n	78.71	21.29	1.872	.874	14.45	18.54
X	'21	**Group 37** Cobbler Greeley	336	.....	415	14.6	77.50	22.50	2.274	1.018	15.78	19.20
			337	.....	316	11.1	78.32	21.68	2.511	1.004	14.64	18.16
			338	.....	280	9.8	76.75	23.25	2.422	1.024	15.98	19.80
X	'21	Do.	3 Tubers,		av. co	mp'n	77.52	22.48	2.402	1.016	15.46	19.06
X	'21	**Group 38** Downing Greeley	445	.....	189	6.6	76.33	23.67	2.963	.944	15.73	19.76
			446	.....	178	6.2	76.15	23.85	2.656	.923	17.59	20.27
			447	.....	143	5.0	76.45	23.55	2.851	.978	15.16	19.72
			448	.....	143	5.0	78.24	21.76	3.025	.892	13.49	17.84
X	'21	Do.	4 Tubers,		av. co	mp'n	76.78	23.22	2.876	.936	15.49	19.40
X	'21	**Group 39** Ohio Greeley	399	.....	209	7.3	79.24	20.75	2.425	.905	13.70	17.42
			400	.....	199	7.0	78.26	21.74	2.468	.972	14.71	18.30
			401	.....	175	6.1	78.55	21.45	2.550	.868	14.00	18.03
			402	.....	167	5.9	77.70	22.30	2.683	.934	15.40	18.66
X	'21	Do.	4 Tubers,		av. co	mp'n	78.44	21.56	2.531	.920	14.45	18.11
X	'21	**Group 40** Peach Blow Greeley	286	.....	294	10.3	77.94	22.06	1.794	1.002	12.10	19.26
			287	.....	175	6.1	76.86	23.14	2.250	.847	16.38	20.04
			288	.....	169	5.9	78.61	21.39	2.204	.899	14.18	18.28
			283	.....	105	3.7	82.32	17.68	1.903	.857	12.35	14.92
X	'21	Do.	4 Tubers,		av. co	mp'n	78.93	21.07	2.038	.901	14.18	18.13
X	'21	**Group 41** Rural Greeley	262	.....	221	7.8	79.18	20.82	2.108	.984	14.73	17.72
			263	.....	180	6.3	78.15	21.85	2.148	.984	15.87	18.71
			264	.....	273	6.1	79.13	20.87	2.009	1.010	16.20	17.85
			268	.....	299	10.5	80.30	19.70	1.639	.991	14.42	17.06
			269	.....	262	9.2	79.50	20.50	1.439	.829	14.69	18.23
			270	.....	224	7.9	80.24	19.76	1.650	.842	14.68	17.26
X	'21	Do.	6 Tubers,		av. co	mp'n	79.41	20.59	1.834	.940	15.10	17.81
X	**'21**	**Total:**	**27 Tubers,**		**av. co**	**mp'n**	**78.44**	**21.56**	**2.201**	**.924**	**14.81**	**18.43**

TABLE I, Part A—Continued

Grower	Year	Variety of Potato; Locality Where Grown	No. of Tuber Analyzed	No. of Hill	Weight		Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by diff.)
					Grams	Ounces	%	%	%	%	%	%
XI	'21	**Group 42**										
		Pearl	377	.....	459	16.2	78.32	21.68	2.416	.958	14.42	18.30
		Greeley	378	.....	346	12.2	79.14	20.86	2.468	.984	13.84	17.40
		Irrigations: 3	380	.....	280	9.8	77.31	22.69	2.041	.937	15.39	19.71
			381	.....	267	9.4	76.77	23.23	2.541	1.013	15.62	19.67
			379	.....	247	8.7	82.14	17.86	1.736	.838	11.61	15.28
			382	.....	235	8.3	81.14	18.86	2.518	.995	12.46	15.27
XI	'21	Do.	6 Tu	bers,	av. co	mp'n	79.14	20.86	2.287	.936	13.89	17.60
XI	'21	**Group 43**										
		Pearl	386	.....	300	10.6	79.40	20.60	2.699	.898	13.84	17.00
		Greeley	383	.....	275	9.7	79.50	20.50	2.365	.970	13.76	17.16
		Irrigations: 5	384	.....	270	9.1	77.50	22.50	2.388	.897	14.86	19.21
			385	.....	268	9.4	77.61	22.39	2.699	.931	14.58	18.76
			388	.....	261	9.2	82.01	17.99	1.802	.905	12.75	15.41
			387	.....	259	9.1	77.20	22.80	2.330	.898	15.13	19.57
XI	'21	Do.	6 Tu	bers,	av. co	mp'n	78.87	21.13	2.380	.913	14.15	17.85
XI	'21	**Group 44**										
		Pearl	389	.....	375	13.2	78.38	21.62	2.088	.888	15.17	18.64
		Greeley	390	.....	333	11.7	76.41	23.59	2.358	.939	16.74	20.29
		Irrigations: 7	391	.....	273	9.6	75.42	24.58	1.912	.863	16.98	21.80
			392	.....	262	9.2	77.73	22.27	2.242	.986	14.37	19.04
			394	.....	249	8.7	75.41	24.59	2.455	.986	16.42	21.15
			393	.....	238	8.4	78.50	21.50	2.808	.910	13.71	17.78
XI	'21	Do.	6 Tu	bers,	av. co	mp'n	76.97	23.03	2.310	.929	15.56	19.79
XI	**'21**	**Total:**	**18 Pe**	**arls,**	**av. co**	**mp'n**	**78.33**	**21.67**	**2.325**	**.929**	**14.53**	**18.42**
XI	'21	**Group 45**										
		Rural	363	.....	341	12.0	78.87	21.13	2.330	.857	14.88	71.94
		Greeley	359	.....	326	11.5	77.68	22.32	2.309	.891	15.38	19.12
		Irrigations: 3	360	.....	256	9.0	79.78	20.22	2.251	.865	13.05	17.10
			361	.....	247	8.7	78.92	21.08	2.379	.920	12.45	17.78
			362	.....	217	7.6	77.90	22.10	2.372	.870	14.77	18.85
			364	.....	213	9.4	79.02	20.98	2.408	.813	14.00	17.75
XI	'21	Do.	6 Tu	bers,	av. co	mp'n	78.70	21.30	2.341	.869	14.09	18.09
XI	'21	**Group 46**										
		Rural	368	.....	282	9.9	78.42	21.58	2.294	.871	14.56	18.41
		Greeley	365	.....	275	9.7	79.91	20.09	2.561	.835	13.62	16.69
		Irrigations: 5	366	.....	275	9.7	78.27	21.73	2.298	.913	13.36	18.51
			367	.....	261	9.2	78.12	21.88	2.561	.952	14.10	18.35
			369	.....	251	8.8	78.42	21.58	2.193	.938	14.30	18.46
			370	.....	226	7.9	76.90	23.10	2.206	.906	15.88	19.98
XI	'21	Do.	6 Tu	bers,	av. co	mp'n	78.34	21.66	2.352	.902	14.30	18.40
XI	'21	**Group 47**										
		Rural	371	.....	391	13.8	78.78	21.22	2.304	.915	14.59	18.00
		Greeley	372	.....	280	9.8	77.32	22.68	2.244	.965	15.08	19.47
		Irrigations: 7	376	.....	265	9.3	78.85	21.15	2.329	.860	13.41	17.96
			373	.....	257	9.0	77.15	22.85	2.206	1.013	15.13	19.63
			375	.....	245	8.6	75.27	24.73	3.114	.936	17.54	21.68
			374	.....	217	7.6	77.06	22.94	2.295	1.022	15.61	19.62
XI	'21	Do.	6 Tu	bers,	av. co	mp'n	77.40	22.60	2.248	.952	15.25	19.40
XI	**'21**	**Total:**	**18 Ru**	**rals,**	**av. co**	**mp'n**	**78.15**	**21.85**	**2.314**	**.908**	**14.55**	**18.13**
XI	**'21**	**Total:**	**36 Tu**	**bers,**	**av. co**	**mp'n**	**78.24**	**21.76**	**2.320**	**.918**	**14.54**	**18.52**

TABLE I, Part A—Continued

Grower	Year	Variety of Potato: Locality Where Grown	No. of Tuber Analyzed	No. of Hill	Weight		Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by dif.)
					Grams	Ounces						
		Group 48					%	%	%	%	%	%
XI	'22	Pearl	477	....	282	9.9	75.85	24.15	2.472	.908	16.95	20.76
		Greeley	478	....	244	8.6	75.49	24.51	1.932	1.014	17.62	21.56
		Irrigations: 11	497	....	239	8.4	72.23	27.77	2.301	1.073	19.83	24.39
			480	....	155	5.4	73.73	26.27	2.300	1.062	18.91	22.90
XI	'22	Do.	4 Tubers,		av. co	mp'n	74.33	25.67	2.251	1.014	18.33	22.39
		Group 49										
XI	'22	Pearl	481	....	343	12.1	75.36	24.64	2.911	.949	17.06	20.72
		Greeley	482	....	316	11.1	75.84	24.16	2.925	.925	16.43	20.31
		Irrigations: 4	483	....	273	9.6	77.93	22.07	2.915	.991	14.84	18.16
		Sandy Soil	484	....	253	9.0	74.27	25.73	2.571	1.001	17.72	22.15
XI	'22	Do.	4 Tubers,		av. co	mp'n	75.85	24.15	2.831	.967	16.51	20.35
		Group 50										
XI	'22	Pearl	485	....	276	9.7	77.48	22.52	2.974	.809	15.13	18.73
		Greeley	486	....	275	9.7	77.24	22.76	2.851	.886	14.72	19.02
		Irrigations: 7	487	....	238	8.4	77.91	22.09	2.518	.947	14.38	18.62
		Sandy Soil	488	....	237	8.3	76.01	23.99	3.194	1.018	16.09	19.77
XI	'22	Do.	4 Tubers,		av. co	mp'n	77.16	22.84	2.881	.915	15.08	19.04
		Group 51										
XI	'22	Pearl	489	....	367	12.9	78.41	21.59	2.423	1.017	15.17	18.15
		Greeley	490	....	357	12.6	78.03	21.97	2.768	1.059	15.33	18.14
		Irrigations: 7	491	....	272	9.6	77.66	22.34	2.273	.976	15.27	19.09
		Medium Heavy Soil	492	....	262	9.2	75.70	24.30	2.466	.972	16.74	19.86
XI	'22	Do.	4 Tubers,		av. co	mp'n	77.45	22.55	2.482	1.004	15.63	19.06
		Group 52										
XI	'22	Pearl	493	....	457	16.1	78.48	21.52	2.374	1.022	14.70	18.12
		Greeley	494	....	440	15.5	78.36	21.64	2.184	1.031	15.16	18.42
		Irrigations: 2	495	....	345	12.1	80.07	19.93	2.227	1.024	13.08	16.67
		Adobe Soil	496	....	327	11.5	79.65	20.35	2.325	1.002	13.91	17.02
XI	'22	Do.	4 Tubers,		av. co	mp'n	79.14	20.86	2.230	1.020	14.21	17.56
XI	**'22**	**Total:**	**20 Pearls,**		**av. co**	**mp'n**	**76.79**	**23.21**	**2.545**	**.984**	**15.95**	**19.68**
		Group 53										
XI	'22	Rural	465	....	463	12.9	77.00	23.00	2.016	.898	16.54	20.08
		Greeley	466	....	432	15.2	78.12	21.88	2.424	.947	14.32	18.50
		Irrigations: 8	467	....	375	13.2	77.67	22.33	2.181	.942	16.80	19.20
			468	....	279	9.8	76.38	23.62	2.153	.800	16.10	20.66
XI	'22	Do.	4 Tubers,		av. co	mp'n	77.29	22.71	2.193	.896	15.94	19.62
		Group 54										
XI	'22	Rural	469	....	344	12.1	76.51	23.49	2.169	.831	16.48	20.49
		Greeley	470	....	297	10.4	77.47	22.53	2.481	.822	15.45	19.22
		Irrigations: 10	471	....	290	10.2	77.83	22.17	2.271	.859	15.60	19.04
			472	....	260	9.1	75.32	24.68	2.142	.914	17.30	21.62
			528	....	361	12.7	81.07	18.93	2.004	.956	12.87	15.87
			531	....	350	12.3	75.79	24.21	2.720	1.021	16.42	20.47
			534	....	344	12.1	74.60	25.40	2.769	1.013	16.94	21.61
			537	....	304	10.7	74.83	25.17	2.127	948	18.17	22.09
XI	'22	Do.	8 Tubers,		av. co	mp'n	76.67	23.33	2.335	.920	16.15	20.08
		Group 55										
XI	'22	Rural	473	.....	390	13.7	77.50	22.50	2.172	.970	15.16	19.35
		Greeley	474	.....	268	9.4	76.94	23.06	2.120	.983	16.02	19.95
		Irrigations: 11	475	.....	260	9.1	76.95	23.05	2.332	.976	15.83	19.74
			476	.....	238	8.4	77.64	22.36	2.197	.988	15.76	19.17
XI	'22	Do.	4 Tubers,		av. co	mp'n	77.26	22.74	2.206	.979	15.69	19.55
XI	**'22**	**Total:**	**16 Rurals,**		**av. co**	**mp'n**	**76.97**	**23.03**	**2.267**	**.929**	**15.98**	**19.83**
XI	**'22**	**Total:**	**36 Tubers,**		**av. co**	**mp'n**	**76.87**	**23.13**	**2.421**	**.959**	**15.96**	**19.75**
XI	**'21**	**Total:**	**72 Tubers,**		**av. co**	**mp'n**	**77.55**	**22.45**	**2.355**	**.953**	**15.24**	**19.12**
Growers 1-XI, '19-'22; 338 Tubers:							**77.23**	**22.77**	**2.020**	**.955**	**16.02**	**19.79**

TABLE I—Concluded

Part B, Dry Land Potatoes

Grower	Year	Variety of Potato; Locality Where Grown	No. of Tuber Analyzed	No. of Hill	Weight		Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates Dig. Def.
					Grams	Ounces	%	%	%	%	%	%
XII	'21	**Group 56** Late Rose Briggsdale	429	.....	175	6.1	74.40	25.60	2.442	1.146	17.29	22.01
			430	.....	156	5.5	74.52	25.48	2.424	.988	17.60	22.06
			431	.....	154	5.4	75.41	24.59	2.345	1.134	16.44	21.11
			432	.....	149	5.2	75.17	24.83	3.106	.870	16.63	20.85
XII	'21	Do.	4 Tubers,		av. co	mp'n	74.87	25.13	2.579	1.034	16.99	21.52
XII	'21	**Group 57** Ohio Briggsdale	353	.....	244	8.6	74.55	25.45	2.642	1.075	17.68	21.73
			354	.....	187	6.6	73.55	26.45	2.799	1.090	16.25	22.56
			355	.....	151	5.3	74.62	25.38	2.565	1.077	16.46	21.75
XII	'21	Do.	3 Tubers,		av. co	mp'n	74.24	25.76	2.668	1.084	16.75	22.01
XII	'21	**Group 58** Pearl Briggsdale	395	.....	225	7.9	76.15	23.85	2.345	1.167	16.22	20.33
			396	.....	217	7.6	76.29	23.71	2.327	1.092	15.44	20.29
			397	.....	190	6.7	76.74	23.26	2.067	1.065	16.61	20.19
			398	.....	189	6.6	76.88	23.12	2.477	1.080	14.77	19.56
			437	.....	175	6.1	79.82	20.18	2.616	1.006	13.15	16.55
			438	.....	153	5.4	79.06	20.94	2.576	1.081	14.21	17.28
			439	.....	152	5.3	76.60	23.40	2.279	1.168	15.52	19.95
			440	.....	147	5.1	76.64	23.36	2.410	1.099	15.68	19.85
XII	'21	Do.	8 Tubers,		av. co	mp'n	77.27	22.73	2.387	1.095	15.20	19.24
XII	'21	**Group 59** Peach Blow Briggsdale	280	.....	195	6.8	78.72	21.28	1.677	.983	14.43	18.61
			281	.....	157	5.5	79.66	20.34	1.944	1.060	13.76	17.33
			282	.....	144	5.0	79.86	20.14	1.998	1.069	13.61	17.07
XII	'21	Do.	3 Tubers,		av. co	mp'n	79.41	20.59	1.873	1.037	13.93	17.67
XII	**'21**	**Total:**	**18 Tubers,**		**av. co**	**mp'n**	**76.58**	**23.42**	**2.390**	**1.070**	**15.64**	**19.95**
XIII	'21	**Group 60** Peach Blow Briggsdale	274	.....	280	9.8	78.20	21.80	2.203	1.087	15.00	18.51
			275	.....	236	8.3	77.25	22.75	2.298	1.294	15.51	19.15
			276	.....	172	6.3	80.51	19.49	1.787	.958	13.73	16.72
XIII	'21	Do.	3 Tubers,		av. co	mp'n	78.65	21.35	2.089	1.113	14.75	18.13
XIII	'21	**Group 61** Rural Briggsdale	271	.....	272	9.3	77.90	22.10	2.055	1.068	14.85	18.96
			272	.....	251	8.8	78.48	21.52	1.850	1.045	15.84	18.62
			273	.....	199	7.0	79.95	20.05	2.154	1.060	13.60	16.83
XIII	'21	Do.	3 Tubers,		av. co	mp'n	78.77	21.23	2.019	1.057	14.76	18.14
XIII	**'21**	**Total:**	**6 Tubers,**		**av. co**	**mp'n**	**78.71**	**21.29**	**2.054**	**1.085**	**14.75**	**19.13**
Growers XII-XIII			**24 Tubers,**		**av. co**	**mp'n**	**77.12**	**22.88**	**2.306**	**1.073**	**15.43**	**19.49**

TABLE II

Chemical Composition of Potatoes below 100 grams (3½oz.) in Weight

Grower	Year	Variety Locality	No. of Tuber Analyzed	No. of Hill	Weight		Water	Dry Matter	Nitrogenous Matter	Ash*	Starch**	Carbohydrates (by dif.)
					Grams	Ounces	%	%	%	%	%	%
		Group 1, Table I										
I	'19	Brown Beauty San Luis Valley	55	I	92	3.2	73.36	26.64	1.104	.819	**18.76**	24.72
			56	I	50 44 33	1.7 1.5 1.1	82.26	17.74	.936	.770	**12.49**	16.03
			62	III	75	2.6	73.57	26.43	1.737	.856	19.45	23.83
			65	IV	92	3.2	77.23	22.77	1.476	.874	17.48	20.42
I	'19	Do.	4 Tu	bers,	av. co	mp'n	76.60	23.40	1.313	.829	**17.04**	21.26
		Group 2, Table I										
I	'19	Burbank San Luis Valley	69	I	96	3.3	76.40	23.60	1.327	1.025	17.69	21.25
			70	I	40	1.4	72.66	27.34	1.586	1.004	**19.25**	24.75
			71	I	38	1.3	75.74	24.26	1.538	1.006	**17.08**	21.71
			76	II	79	2.7	75.19	24.81	1.404	.916	17.90	21.49
			77	II	68	2.4	75.58	24.42	1.543	1.061	**17.20**	21.81
			78	II	31	1.1	72.95	27.05	1.213	.874	**19.05**	24.96
			79	II	30	1.0	72.44	27.56	1.315	.904	**19.41**	25.34
			85	IV	91	3.2	80.42	19.58	1.318	.772	13.90	17.49
			86	IV	59	2.1	71.77	28.23	1.258	.862	20.73	26.11
			87	IV	51	1.8	74.04	25.96	1.437	.950	**18.28**	23.57
			92	V	88	3.1	80.32	19.68	1.426	.832	**13.86**	17.42
			93	V	74	2.6	74.36	25.64	1.577	.749	**18.06**	23.31
			94	V	33	1.1	77.17	22.83	1.564	.816	**16.08**	20.45
I	'19	Do.	13 Tu	bers,	av. co	mp'n	75.31	24.69	1.346	.905	**17.57**	22.44
		Group 3, Table I										
I	'19	Pearl San Luis Valley	3	IV	75 35 39	2.1 1.2 1.3	72.99	27.01	1.857	1.113	19.55	24.04
			5	V	88	3.1	76.22	23.78	1.095	.887	18.58	21.80
			6	V	52 52 49	1.8 1.8 1.7	81.31	18.69	1.287	**.870**	**13.16**	**16.53**
			9	VI	83	2.9	83.41	16.59	1.192	.785	**11.68**	14.61
			10	VI	74	2.6	77.72	22.28	1.656	.990	**15.69**	19.63
			11	VI	41	1.4	77.35	22.65	1.661	**.891**	**15.95**	**20.10**
			12	VI	27	1.0	85.24	14.76	1.429	**1.036**	**10.39**	**12.29**
			15	VII	57	2.0	76.30	23.70	1.618	**.914**	**16.69**	**21.17**
			16	VII	53	1.8	76.25	23.75	1.488	**.994**	**16.72**	**21.27**
			17	VII	17	0.6	82.14	17.86	1.513	**.978**	**12.58**	**15.37**
I	'19	Do.	10 Tu	bers,	av. co	mp'n	78.89	21.11	1.479	**1.001**	**15.10**	**18.63**
		Group 4, Table I										
I	'19	Rural San Luis Valley	25	I	95	3.3	70.97	29.03	1.085	1.098	23.70	26.84
			26	I	38	1.3	74.59	25.41	1.000	1.007	**17.89**	23.40
			27	I	37	1.3	77.47	22.53	1.222	1.039	**17.98**	20.27
			30	II	96	3.3	72.53	27.47	1.313	1.094	20.41	25.06
			33	III	95	3.3	74.10	25.90	1.170	1.066	19.43	23.66
			34	III	78	2.3	74.72	25.28	1.123	1.023	19.84	23.13
			35	III	37	1.3	79.04	20.96	1.127	.862	**14.76**	18.97
			40	IV	41	1.4	81.61	18.39	1.004	.866	13.24	16.52
			41	IV	40	1.4	80.15	19.85	.895	.955	14.85	18.00
			45	VI	98	3.4	78.74	21.26	1.406	.920	16.11	18.93
			46	VI	95	3.3	75.08	24.92	1.194	.972	19.55	22.75
I	'19	Do.	11 Tu	bers,	av. co	mp'n	76.27	23.73	1.140	.991	**17.97**	21.60
I	'19	Total:	38 Tu	bers,	av. co	mp'n	76.66	23.34	1.318	**.947**	**16.92**	**21.06**
		Group 40, Table I										
X	'21	Peach	284	.....	78	2.3	78.14	21.86	1.903	.823	15.99	19.14
			285	.....	76	2.6	80.48	19.52	1.687	.710	14.10	17.12
X	'21	Do.	2 Tu	bers,	av. co	mp'n	73.31	20.69	1.795	.766	15.04	18.13

* Ash percentages, in heavy type, were calculated by using the ratio of ash to nitrogenous matter, 1 : 1.48, in San Luis Valley potatoes (see pp. 30 and 34.)

** Starch percentages, in heavy type, were calculated by use of the ratio of starch to dry matter, 1 : 1.42, (see pp. 26 and 33.)

TABLE III

Chemical Composition of Colorado Potatoes, above 100 grams in Weight (Table I, Condensed and Arranged according to Locality)

Part A, Irrigated Potatoes

Locality Variety of Potato	Grower	Year	No. of Tuber Analyzed	Weight		Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by diff.)
				Grams	Ounces	%	%	%	%	%	%
1. Carbondale											
Burbank	V	'20	6								
Maximum				459	16.1	77.30	24.59	2.284	1.033	17.77	21.58
Minimum				308	10.8	75.41	22.70	1.751	.847	15.72	19.55
Average						**76.52**	**23.48**	**2.053**	**.931**	**16.82**	**20.49**
Burbank	V	'21	9								
Maximum				757	26.7	76.75	29.08	2.559	.955	19.14	25.62
Minimum				318	11.2	70.92	23.25	2.118	.798	16.77	20.13
Average						**74.18**	**25.82**	**2.335**	**.882**	**17.78**	**22.60**
Burbank	V	'22	10								
Maximum				305	10.7	75.50	28.09	2.343	1.156	19.68	24.98
Minimum				127	4.5	71.91	24.50	1.468	.893	17.28	21.69
Average						**73.77**	**26.23**	**1.964**	**.989**	**18.94**	**23.27**
Burbank	IX	'21	14								
Maximum				605	21.3	79.03	25.80	2.502	1.004	17.00	22.49
Minimum				263	9.3	74.20	20.97	2.010	.710	14.07	17.92
Average						**76.17**	**23.83**	**2.236**	**.864**	**15.87**	**20.72**
Burbank	VIII	'21	6								
Maximum				821	28.9	78.04	25.83	2.229	1.029	17.45	22.99
Minimum				210	7.4	74.17	21.96	1.677	.840	14.67	18.96
Average						**76.37**	**23.63**	**1.990**	**.929**	**16.04**	**20.71**
Cobbler	V	'22	3								
Maximum				184	6.5	76.60	24.96	2.272	.983	17.91	22.07
Minimum				149	5.2	75.04	23.40	1.928	.906	16.34	20.22
Average						**75.63**	**24.37**	**2.127**	**.948**	**17.38**	**21.29**
Gold Coin	IX	'21	8								
Maximum				420	14.8	74.66	28.00	2.254	1.200	19.32	24.60
Minimum				153	5.4	72.00	25.34	1.926	.870	17.06	22.19
Average						**72.95**	**27.05**	**2.286**	**.958**	**18.60**	**23.80**
Carbondale, 56 tubers, av.	**comp'n**					**74.98**	**25.02**	**2.151**	**.921**	**17.31**	**21.93**
2. Divide											
Burbank	VII	'20	6								
Maximum				290	10.2	77.47	24.40	2.128	1.254	18.10	21.53
Minimum				165	5.8	75.60	22.53	1.696	.896	15.71	19.93
Average						**76.65**	**23.35**	**1.943**	**1.082**	**16.70**	**20.32**
Cobbler	VI	'20	6								
Maximum				261	9.2	79.89	24.28	2.324	.968	17.11	21.82
Minimum				178	6.2	75.72	20.11	1.476	.695	13.97	17.23
Average						**77.77**	**22.23**	**2.023**	**.805**	**15.65**	**19.40**
Ohio	VI	'20	5								
Maximum				262	9.2	78.80	23.86	3.120	1.095	16.86	19.20
Minimum				200	7.0	76.14	21.20	2.547	.918	14.02	17.40
Average						**77.57**	**22.43**	**2.813**	**1.059**	**16.03**	**18.55**
Peach Blow	VI	'20	6								
Maximum				282	9.9	81.79	19.86	1.677	.916	15.02	17.67
Minimum				186	6.5	80.14	18.21	1.419	.632	13.09	15.88
Average						**80.88**	**19.12**	**1.519**	**.785**	**13.87**	**16.81**
Pearl	VI	'20	6								
Maximum				394	13.9	83.31	23.77	2.713	.983	15.83	20.50
Minimum				189	6.6	76.23	16.69	1.817	.802	11.35	13.93
Average						**80.23**	**19.77**	**2.097**	**.905**	**13.35**	**16.76**
Triumph	VI	'20	3								
Maximum				287	10.1	83.02	19.04	2.198	.770	13.45	16.21
Minimum				181	6.4	80.96	16.98	2.132	.666	12.44	14.01
Average						**82.25**	**17.75**	**2.176**	**.709**	**12.87**	**14.86**
Divide, 32 tubers, av. com	**p'n**					**78.68**	**21.32**	**2.080**	**.965**	**14.91**	**18.27**

TABLE III, Part A—Continued

Locality; Variety of Potato	Grower	Year	No. of Tuber Analyzed	Weight		Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by dif.)
				Grams	Ounces	%	%	%	%	%	%
3. Greeley											
Brown Beauty	III	'20	60								
Maximum				187	6.6	79.89	24.51	2.520	1.126	15.62	21.12
Minimum				145	5.1	75.49	20.11	2.149	.904	13.52	16.87
Average						**77.78**	**22.22**	**2.287**	**1.032**	**14.89**	**19.90**
Burbank	III	'20	6								
Maximum				220	7.7	79.78	23.85	2.359	1.062	17.82	20.82
Minimum				130	4.6	76.15	20.22	2.000	.734	13.20	17.10
Average						**78.42**	**21.58**	**2.129**	**.932**	**14.97**	**18.50**
Burbank	X	'21	6								
Maximum				298	10.5	79.14	21.54	2.061	.970	15.05	19.17
Minimum				140	4.9	78.46	20.86	1.434	.824	13.62	17.84
Average						**78.71**	**21.29**	**1.872**	**.874**	**14.45**	**18.54**
Cobbler	IV	'20	6								
Maximum				457	16.1	78.49	24.82	2.656	.997	18.61	21.58
Minimum				188	6.6	75.18	21.51	2.226	.869	14.88	18.07
Average						**76.58**	**23.42**	**2.516**	**.947**	**16.77**	**19.95**
Cobbler	X	'21	3								
Maximum				415	14.6	78.32	23.25	2.511	1.024	15.98	19.80
Minimum				280	9.8	76.75	21.68	2.274	1.004	14.64	18.16
Average						**77.52**	**22.48**	**2.402**	**1.016**	**15.46**	**19.06**
Downing	X	'21	4								
Maximum				189	6.6	78.24	23.85	3.025	.978	17.59	20.27
Minimum				143	5.0	76.15	21.76	2.656	.892	13.49	17.84
Average						**76.78**	**23.22**	**2.876**	**.936**	**15.49**	**19.40**
Ohio	IV	'20	6								
Maximum				306	10.7	81.16	24.24	2.765	1.195	17.46	21.05
Minimum				205	7.2	75.76	18.84	2.144	.569	14.01	15.90
Average						**78.00**	**22.00**	**2.415**	**.815**	**16.18**	**18.77**
Ohio	X	'21	4								
Maximum				209	7.3	79.25	22.30	2.683	.972	15.40	18.30
Minimum				167	5.9	77.70	20.75	2.425	.868	13.70	17.42
Average						**78.44**	**21.56**	**2.531**	**.920**	**14.45**	**18.11**
Peach Blow	IV	'20	6								
Maximum				355	12.5	79.55	24.69	2.386	1.018	16.97	21.38
Minimum				186	6.5	75.31	20.45	1.849	.779	14.80	17.45
Average						**77.97**	**22.03**	**2.118**	**.919**	**15.83**	**18.99**
Peach Blow	X	'21	4								
Maximum				294	10.3	82.32	23.14	2.250	1.002	16.38	20.04
Minimum				105	3.7	76.86	17.68	1.794	.841	12.10	14.92
Average						**78.93**	**21.07**	**2.038**	**.901**	**14.18**	**18.12**
Pearl	III	'20	6								
Maximum				308	10.8	80.36	22.80	2.728	1.013	15.38	19.65
Minimum				197	6.9	77.20	19.64	2.174	.814	13.20	16.72
Average						**79.16**	**20.84**	**2.400**	**.925**	**14.22**	**17.67**
Pearl	XI	'21	18								
Maximum				459	16.2	82.14	24.59	2.699	1.067	16.98	21.80
Minimum				235	8.3	75.41	17.86	1.736	.768	11.61	15.27
Average						**78.33**	**21.67**	**2.325**	**.929**	**14.53**	**18.42**
Pearl	XI	'22	20								
Maximum				457	16.1	80.07	27.77	2.974	1.073	19.83	24.39
Minimum				155	5.4	72.23	19.93	1.932	.809	13.08	16.67
Average						**76.79**	**23.21**	**2.545**	**.984**	**15.95**	**19.68**
Rural	III	'20	6								
Maximum				438	15.4	80.47	21.85	2.338	1.046	15.60	18.59
Minium				259	9.1	78.15	19.53	1.942	.918	14.08	16.54
Average						**79.02**	**20.98**	**2.141**	**.983**	**14.80**	**17.85**
Rural	X	'21	18								
Maximum				391	13.8	79.91	24.73	2.561	1.022	17.54	19.98
Minimum				213	7.5	75.27	20.09	2.114	.813	12.45	16.69
Average						**78.15**	**21.85**	**2.314**	**.908**	**14.55**	**18.63**
Rural	XI	'22	16								
Maximum				463	16.3	81.07	25.40	2.769	1.021	18.17	22.09
Minimum				238	8.4	74.60	18.93	2.004	.800	12.87	15.86
Average						**76.97**	**23.03**	**2.267**	**.929**	**15.98**	**19.83**
Triumph	IV	'20	3								
Maximum				233	8.2	81.76	20.03	2.421	.791	14.45	16.93
Minimum				204	7.2	79.97	18.24	2.271	.734	12.30	15.13
Average						**81.13**	**18.87**	**2.355**	**.782**	**13.30**	**15.75**
Greeley, 144 tubers, av.	comp'n					**77.98**	**22.02**	**2.312**	**.932**	**15.16**	**18.77**

TABLE III, Part A—Continued

Locality; Variety of Potato	Grower	Year	No. of Tuber Analyzed	Weight		Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by dif.)
				Grams	Ounces	%	%	%	%	%	%
4. San Luis Valley											
Blue Victor	I	'21	6								
Maximum				349	12.3	79.22	27.05	1.794	1.256	19.35	24.00
Minimum				232	8.2	72.95	20.78	1.231	.977	13.63	18.30
Average						**77.45**	**22.55**	**1.432**	**1.032**	**15.74**	**20.07**
Brown Beauty	I	'19	9								
Maximum				275	9.7	81.85	27.59	1.509	1.071	21.61	25.26
Minimum				110	3.9	72.41	18.15	1.104	.694	12.32	16.12
Average						**76.31**	**23.69**	**1.368**	**.968**	**17.78**	**21.24**
Brown Beauty	I	'20	6								
Maximum				459	16.2	83.13	22.51	1.949	1.055	15.07	19.83
Minimum				139	4.9	77.49	16.87	1.521	.794	11.72	14.51
Average						**80.35**	**19.65**	**1.708**	**.943**	**13.47**	**17.00**
Brown Beauty	I	'21	4								
Maximum				287	10.1	76.12	26.35	1.769	1.071	19.23	23.99
Minimum				233	8.2	73.65	23.88	1.184	1.015	16.67	21.12
Average						**75.19**	**24.81**	**1.383**	**1.054**	**17.64**	**22.37**
Burbank	I	'19	18								
Maximum				250	8.8	79.27	25.36	1.549	1.073	19.33	22.94
Minimum				103	3.6	74.64	20.73	1.282	.902	14.37	18.26
Average						**76.81**	**23.19**	**1.447**	**.995**	**16.94**	**20.74**
Burbank	I	'20	6								
Maximum				356	12.5	79.75	24.10	1.724	1.014	14.60	21.37
Minimum				208	7.3	75.90	20.25	1.546	.850	14.04	17.60
Average						**78.12**	**21.88**	**1.653**	**.944**	**14.27**	**19.30**
Burbank	I	'21	9								
Maximum				385	13.6	78.82	26.41	2.395	1.065	18.09	23.74
Minimum				173	6.1	73.59	21.18	1.339	.886	14.35	18.11
Average						**76.60**	**23.40**	**1.801**	**1.008**	**16.13**	**20.50**
Burbank	I	'22	4								
Maximum				432	15.2	77.30	25.32	2.326	.941	19.60	22.25
Minimum				325	11.4	74.68	22.70	2.086	.868	16.30	19.49
Average						**75.92**	**24.08**	**2.198**	**.904**	**17.56**	**20.97**
Cobbler	I	'21	6								
Maximum				344	12.1	78.60	24.39	1.147	.959	20.09	23.60
Minimum				249	8.8	75.61	21.40	.883	.810	14.87	18.55
Average						**77.45**	**22.55**	**1.026**	**.911**	**18.28**	**21.42**
Peach Blow	I	'21	3								
Maximum				349	12.3	80.08	21.18	1.475	.972	16.67	19.31
Minimum				282	9.9	78.32	19.92	1.390	.953	13.88	17.55
Average						**79.20**	**20.80**	**1.426**	**.963**	**15.40**	**13.40**
Pearl	I	'19	13								
Maximum				467	16.4	79.58	25.81	1.470	1.054	20.09	23.60
Minimum				122	4.3	74.19	20.42	1.046	.823	14.87	18.55
Average						**76.39**	**23.61**	**1.287**	**.911**	**18.28**	**21.42**
Pearl	I	'20	6								
Maximum				304	10.7	81.72	21.30	1.811	1.186	15.25	18.62
Minimum				171	6.0	78.70	18.28	1.273	.793	12.75	15.90
Average						**79.91**	**20.09**	**1.560**	**.969**	**14.24**	**17.56**
Rural	I	'19	12								
Maximum				309	10.9	75.64	27.39	1.431	1.520	21.81	25.24
Minimum				107	3.7	72.61	24.36	.868	1.001	18.17	21.99
Average						**74.29**	**25.71**	**1.226**	**1.270**	**20.53**	**23.30**
Rural	I	'20	4								
Maximum				356	12.5	79.57	21.66	1.634	1.078	16.00	18.94
Minimum				265	9.3	78.34	20.43	1.504	.964	15.21	17.96
Average						**78.84**	**21.16**	**1.538**	**.997**	**15.57**	**18.63**
San Luis Valley, 106 Tube	**rs, av**	**. com**	**p'n**			**76.87**	**23.13**	**1.462**	**1.002**	**16.84**	**20.66**
Total Irrigated tubers,	**338,**	**av. co**	**mp'n**			**77.23**	**22.77**	**2.020**	**.955**	**16.02**	**19.79**

TABLE III—Concluded

Part B, Dry Land Potatoes

Locality; Variety of Potato	Grower	Year	No. of Tuber Analyzed	Weight		Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by dif.)
				Grams	Ounces	%	%	%	%	%	%
Briggsdale											
Late Rose	XII	'21	4								
Maximum				175	6.1	75.41	25.60	3.106	1.146	17.60	22.06
Minimum				149	5.2	74.40	24.59	2.345	.870	16.44	20.85
Average						**74.87**	**25.13**	**2.579**	**1.034**	**16.99**	**21.52**
Ohio	XII	'21	3								
Maximum				244	8.6	74.62	26.45	2.799	1.090	17.68	22.56
Minimum				151	5.3	73.55	25.38	2.565	1.075	16.25	21.73
Average						**74.24**	**25.76**	**2.668**	**1.084**	**16.75**	**22.01**
Pearl	XII	'21	8								
Maximum				225	7.9	79.82	23.85	2.616	1.168	16.61	20.33
Minimum				147	5.2	76.15	20.18	2.067	1.006	14.21	17.28
Average						**77.27**	**22.73**	**2.387**	**1.095**	**15.20**	**19.24**
Peach Blow	XII	'21	3								
Maximum				244	8.6	74.62	26.45	2.799	1.090	17.68	22.56
Minimum				151	5.3	73.55	25.38	2.565	1.075	16.25	21.73
Average						**74.24**	**25.76**	**2.668**	**1.084**	**16.75**	**22.01**
Peach Blow	XIII	'21	3								
Maximum				280	9.8	80.51	22.75	2.298	1.294	15.51	19.15
Minimum				172	6.0	77.25	19.49	1.787	.958	13.73	16.72
Average						**78.65**	**21.35**	**2.089**	**1.113**	**14.75**	**18.13**
Rural	XIII	'21	3								
Maximum				272	9.6	79.95	22.10	2.154	1.068	15.84	18.96
Minimum				199	7.0	77.90	20.05	1.850	1.045	13.60	16.83
Average						**78.77**	**21.23**	**2.019**	**1.057**	**14.76**	**18.14**
Dry Land, 24 Tubers, av.	**comp**	**'n**				**77.12**	**22.88**	**2.306**	**1.073**	**15.43**	**19.49**

TABLE IV

Summary of Table I

Averages Arranged with Special Reference to Grower

Grower	Variety of Potato;	No. of Tuber Analyzed	Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by dif.)
	PART A, IRRIGATED POTATOES		%	%	%	%	%	%
I	Blue Victor	6	77.45	22.55	1.432	1.032	15.74	20.07
	Brown Beauty	19	77.35	22.65	1.478	.978	16.39	20.19
	Burbank	37	76.79	23.21	1.647	.969	16.38	20.59
	Cobbler	6	77.45	22.55	1.026	.911	15.89	20.55
	Peach Blow	3	79.20	20.80	1.426	.963	15.40	18.40
	Pearl	19	77.50	22.50	1.442	.929	17.00	19.73
	Rural	16	75.43	24.57	1.304	1.077	19.29	22.11
	Average Composition	**106**	**76.87**	**23.13**	**1.462**	**1.002**	**16.84**	**20.66**
III	Brown Beauty	6	77.78	22.22	2.287	1.032	14.89	19.90
	Burbank	6	78.42	21.58	2.129	.932	14.97	18.50
	Pearl	6	79.16	20.84	2.400	.925	14.22	17.67
	Rural	6	79.02	20.98	2.141	.983	14.80	17.85
	Average Composition	**24**	**78.59**	**21.41**	**2.239**	**.968**	**14.72**	**18.10**
IV	Cobbler	6	76.58	23.42	2.516	.947	16.77	19.95
	Ohio	6	78.00	22.00	2.415	.815	16.18	18.77
	Peach Blow	6	77.97	22.03	2.118	.919	15.83	18.99
	Triumph	3	81.13	18.87	2.355	.782	13.30	15.75
	Average Composition	**21**	**78.03**	**21.97**	**2.351**	**.878**	**15.83**	**18.74**
V	Burbank	25	74.58	25.42	2.119	.936	18.01	21.76
	Cobbler	3	75.63	24.37	2.127	.948	17.33	21.29
	Average Composition	**28**	**74.69**	**25.31**	**2.119**	**.938**	**17.94**	**22.25**
VI	Cobbler	6	77.77	22.23	2.023	.805	15.65	19.46
	Ohio	5	77.57	22.43	2.813	1.059	16.03	18.55
	Peach Blow	6	80.88	19.12	1.519	.785	13.87	16.81
	Pearl	6	80.23	19.77	2.097	.905	13.35	16.76
	Triumph	3	82.25	17.75	2.176	.709	12.87	14.86
	Average Composition	**26**	**79.46**	**20.54**	**2.120**	**.868**	**14.52**	**17.55**
VII	Burbank	6	76.65	23.35	1.943	1.082	16.70	20.32
VIII	Burbank	6	76.37	23.63	1.990	.929	16.04	20.71
IX	Burbank	14	76.17	23.83	2.236	.814	15.87	20.72
	Gold Coin	8	72.95	27.05	2.286	.958	18.60	23.80
	Average Composition	**22**	**75.00**	**25.00**	**2.254**	**894**	**16.86**	**21.86**
X	Burbank	6	78.71	21.29	1.872	.874	14.45	18.54
	Cobbler	3	77.52	22.48	2.402	1.016	15.46	19.06
	Downing	4	76.78	23.22	2.881	.936	15.49	19.40
	Ohio	4	78.44	21.56	2.531	.920	14.45	18.11
	Peach Blow	4	78.93	21.07	2.038	.901	14.18	18.12
	Rural	6	79.41	20.59	1.834	.940	15.10	17.81
	Average Composition	**27**	**78.44**	**21.56**	**2.201**	**.924**	**14.81**	**18.43**
XI	Pearl	38	77.51	22.49	2.441	.958	15.27	19.08
	Rural	34	77.59	22.40	2.880	.918	15.22	19.17
	Average Composition	**72**	**77.55**	**22.45**	**2.648**	**.953**	**15.24**	**19.12**
Irrig	**ated, Total Average**	**338**	**77.23**	**22.77**	**2.020**	**.955**	**16.02**	**19.79**
	PART B, DRY LAND POTATOES							
XII	Late Rose	4	74.87	25.13	2.579	1.034	16.99	21.52
	Ohio	3	74.24	25.76	2.668	1.084	16.75	22.01
	Pearl	8	77.27	22.73	2.387	1.095	15.20	19.24
	Peach Blow	3	79.41	20.59	1.873	1.037	13.93	17.67
	Average Composition	**18**	**76.58**	**23.42**	**2.390**	**1.070**	**15.64**	**19.95**
XIII	Peach Blow	3	78.65	21.35	2.089	1.113	14.75	18.13
	Rural	3	78.77	21.23	2.019	1.057	14.76	18.14
	Average Composition	**6**	**78.71**	**21.29**	**2.054**	**1.085**	**14.75**	**19.13**
Dry	**Land, Total Average**	**24**	**77.12**	**22.88**	**2.306**	**1.073**	**15.43**	**19.49**

TABLE V

Summary of Table III
Averages Arranged with Special Reference to Locality

Locality	Variety of Potato	No. of Tubers Analyzed	Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by dif.)
PART A, IRRIGATED POTATOES (above 100 g. in weight)			%	%	%	%	%	%
Carbondale	Burbank	45	75.31	24.71	2.138	.913	17.08	21.23
	Cobbler	3	75.63	24.37	2.127	.948	17.38	21.29
	Gold Coin	8	72.95	27.05	2.286	.958	18.60	23.80
	Average Comp'n	**56**	**74.99**	**25.01**	**2.151**	**.921**	**17.31**	**21.93**
Divide	Burbank	6	76.65	23.35	1.943	1.082	16.70	20.32
	Cobbler	6	77.77	22.23	2.023	.805	15.65	19.40
	Ohio	5	77.57	22.43	2.813	1.059	16.03	18.55
	Peach Blow	6	80.88	19.12	1.519	.785	13.87	16.81
	Pearl	6	80.23	19.77	2.097	.905	13.35	16.76
	Triumph	3	82.25	17.75	2.176	.709	12.87	14.86
	Average Comp'n	**32**	**78.68**	**21.32**	**2.080**	**.965**	**14.91**	**18.27**
Greeley	Brown Beauty	6	77.78	22.22	2.287	1.032	14.89	19.90
	Burbank	12	78.56	21.43	2.001	.903	14.71	18.52
	Cobbler	9	76.89	23.10	2.478	.970	16.33	19.64
	Downing	4	76.79	23.21	2.881	.966	15.49	19.40
	Ohio	10	78.17	21.83	2.461	.856	15.49	18.50
	Peach Blow	10	78.35	21.65	2.086	.911	15.00	18.65
	Pearl	44	77.74	22.26	2.435	.976	15.13	18.89
	Rural	46	78.02	21.98	2.647	.929	15.15	18.05
	Triumph	3	81.13	18.87	2.355	.782	13.30	15.75
	Average Comp'n	**144**	**77.98**	**22.02**	**2.491**	**.939**	**15.16**	**18.59**
San Luis Valley	Blue Victor	6	77.45	22.55	1.432	1.032	15.74	20.07
	Brown Beauty	19	77.34	22.66	1.473	.978	16.38	20.21
	Burbank	37	76.55	23.45	1.646	1.007	16.32	20.80
	Cobbler	6	77.45	22.55	1.026	.911	15.89	20.55
	Peach Blow	3	79.20	20.80	1.426	.963	15.40	18.40
	Pearl	19	77.50	22.50	1.362	.929	17.00	20.21
	Rural	16	75.42	24.58	1.447	1.077	19.29	22.06
	Average Comp'n	**106**	**76.87**	**23.13**	**1.462**	**1.002**	**16.84**	**20.66**
Irrigated, Total Av. Composition		**338**	**77.23**	**22.77**	**2.020**	**.955**	**16.02**	**19.79**
PART B, DRY LAND POTATOES								
Briggsdale	Late Rose	4	74.87	25.13	2.579	1.034	16.99	21.52
	Ohio	3	74.24	25.76	2.668	1.084	16.75	22.01
	Pearl	8	77.27	22.73	2.387	1.095	15.20	19.24
	Peach Blow	6	79.03	20.97	1.981	1.075	14.34	17.90
	Rural	3	78.77	21.23	2.019	1.057	14.75	19.13
Dry Land, Total	**Average Composition**	**24**	**77.12**	**22.88**	**2.306**	**1.073**	**15.43**	**19.49**

TABLE VI

SUMMARY OF TABLE IV

Averages Arranged with Special Reference to Variety of Potato

Variety of Potato	Grower	No. of Tubers Analyzed	Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by diff.)
PART A, IRRIGATED POTATOES								
Blue Victor	I	6	77.45	22.55	1.432	1.032	15.47	20.07
Brown Beauty	I	19	77.35	22.65	1.478	.978	16.39	20.19
	III	6	77.78	22.22	2.287	1.032	14.89	19.90
Average Composition		25	77.45	22.55	1.668	.991	15.66	19.89
Burbank	I	37	76.79	23.21	1.647	.969	16.38	20.59
	III	6	78.42	21.58	2.129	.932	14.97	18.50
	V	25	74.58	25.42	2.119	.936	18.01	21.76
	VII	6	76.65	23.35	1.943	1.082	16.70	20.32
	VIII	6	76.37	23.63	1.990	.929	16.04	20.71
	IX	14	76.17	23.83	2.236	.864	15.87	20.72
	X	6	78.71	21.29	1.872	.874	14.45	18.54
Average Composition		100	76.33	23.67	1.928	.946	16.49	22.88
Cobbler	I	6	77.45	22.55	1.026	.911	15.89	20.55
	IV	6	76.58	23.42	2.516	.947	16.77	19.95
	V	3	75.63	24.37	2.127	.948	17.38	21.24
	VI	6	77.77	22.23	2.023	.805	15.65	19.40
	X	3	77.52	22.48	2.402	1.016	15.46	19.06
Average Composition		24	77.09	22.91	1.957	.911	16.18	21.04
Downing	X	4	76.78	23.22	2.881	.936	15.49	19.40
Gold Coin	XI	8	72.95	27.05	2.286	.958	18.60	23.80
Ohio	IV	6	78.00	22.00	2.415	.815	16.18	18.77
	VI	5	77.57	22.43	2.813	1.059	16.03	18.55
	X	4	78.44	21.56	2.531	.920	14.45	18.11
Average Composition		15	77.97	22.03	2.578	.924	15.67	18.53
Peach Blow	I	3	79.20	20.80	1.426	.963	15.40	18.40
	IV	6	77.97	22.03	2.118	.919	15.83	18.99
	VI	6	80.88	19.12	1.519	.785	13.87	16.87
	X	4	78.93	21.07	2.038	.901	14.18	18.12
Average Composition		19	79.28	20.72	1.799	.871	14.87	18.05
Pearl	I	19	77.50	22.10	1.442	.929	17.00	19.73
	III	6	79.16	20.84	2.400	.925	14.22	17.67
	VI	6	80.23	19.77	2.097	.905	13.35	16.76
	XI	38	77.51	22.49	2.441	.958	15.27	19.08
Average Composition		69	77.87	22.13	2.080	.943	15.50	19.11
Rural	I	16	75.43	24.67	1.304	1.077	19.29	22.11
	III	6	79.02	20.98	2.141	.983	14.80	17.85
	X	6	79.41	20.59	1.834	.940	15.10	17.81
	XI	34	77.59	22.40	2.880	.918	15.22	19.17
Average Composition		62	77.34	22.66	1.985	1.047	16.12	19.63
Triumph	IV	3	81.13	18.87	2.355	.782	13.30	15.75
	VI	3	82.25	17.75	2.176	.709	12.87	14.86
Average Composition		6	81.69	18.31	2.265	.746	13.08	15.30
Irrigated, Total Average		338	77.23	22.77	2.020	.955	16.02	19.79
PART B, DRY LAND POTATOES								
Late Rose	XII	4	76.87	25.13	2.579	1.034	16.99	21.52
Ohio	XII	3	74.24	25.76	2.668	1.084	16.75	22.01
Pearl	XII	8	77.27	22.73	2.387	1.095	15.20	19.24
Peach Blow	XII	3	79.41	20.59	1.873	1.037	13.93	17.67
	XIII	3	78.65	21.35	2.089	1.113	14.75	18.13
Average Composition		6	79.03	20.97	1.981	1.075	14.34	17.90
Rural	XIII	3	78.77	21.23	2.019	1.057	14.75	19.13
Dry Land, Total Average		24	77.12	22.88	2.306	1.073	15.43	19.49

TABLE VII

Approximate Constants in Percentage Composition of Potatoes Averages Arranged with Special Reference to Grower

Grower	Variety of Potato	No. of Tubers Analyzed	Dry Matter — Starch	Starch : Dry Matter :: 1 : x	Total Carbohydrates : Dry Matter :: 1 : x	Starch : Total Carbohydrates :: 1 : x	Starch : Water :: 1 : x	Total Carbohydrates : Water :: 1 : x	Nitrogen + Ash	Nitrogenous Matter + Ash	Ash : Nitrogenous Matter :: 1 : x
	PART A, IRRIGATED POTATOES			x	x	x	x	x			x
I	Blue Victor	6	6 80	1 432	1 123	1 275	4 921	3 858	1 250	2 466	1 388
	Brown Beauty	19	6 26	1 382	1 122	1 232	4 719	3 831	1 214	2 451	1 469
	Burbank	37	6 83	1 417	1 127	1 257	4 688	3 730	1 232	2 653	1 627
	Cobbler	6	6 66	1 419	1 098	1 293	4 874	3 770	1 074	1 936	1 127
	Peach Blow	3	5 40	1 351	1 130	1 196	5 143	4 302	1 192	2 389	1 478
	Pearl	19	5 10	1 300	1 120	1 161	4 559	3 928	1 159	2 231	1 468
	Rural	16	5 38	1 279	1 116	1 146	3 911	3 412	1 285	2 524	1 344
I	**Average**	106	6 29	1 367	1 120	1 220	4 571	3 746	1 215	2 472	1 481
III	Brown Beauty	6	7 33	1 492	1 159	1 336	5 230	4 094	1 388	3 319	2 216
	Burbank	6	6 61	1 445	1 166	1 236	5 238	4 238	1 273	3 061	2 283
	Pearl	6	6 62	1 466	1 179	1 243	5 567	4 480	1 308	3 324	2 594
	Rural	6	6 18	1 418	1 175	1 207	5 366	4 422	1 326	3 124	2 178
III	**Average**	24	6 69	1 455	1 172	1 255	5 350	4 411	1 324	3 207	2 318
IV	Cobbler	6	6 65	1 448	1 201	1 190	4 736	3 927	1 350	3 464	2 658
	Ohio	6	5 82	1 360	1 172	1 160	4 821	4 156	1 201	3 229	2 964
	Peach Blow	6	6 20	1 392	1 160	1 200	4 926	4 105	1 258	3 037	2 303
	Triumph	3	5 67	1 419	1 198	1 192	6 100	5 131	1 159	3 157	3 010
IV	**Average**	21	6 14	1 402	1 180	1 184	5 007	4 215	1 254	3 230	2 678
V	Burbank	25	7 42	1 409	1 139	1 237	4 170	3 356	1 272	3 055	2 288
	Cobbler	3	6 99	1 402	1 144	1 225	4 352	3 551	1 288	3 075	2 243
V	**Average**	28	7 37	1 408	1 134	1 236	4 190	3 377	1 274	3 056	2 260
VI	Cobbler	6	6 58	1 421	1 146	1 240	4 969	4 008	1 128	2 826	2 512
	Ohio	5	6 40	1 399	1 209	1 158	4 839	4 126	1 509	3 872	2 656
	Peach Blow	6	5 25	1 379	1 210	1 140	5 831	4 810	1 030	2 364	1 940
	Pearl	6	6 42	1 481	1 179	1 256	6 010	4 786	1 241	3 002	2 315
	Triumph	3	4 88	1 379	1 194	1 155	6 391	5 533	1 057	2 885	3 067
VI	**Average**	26	6 02	1 416	1 186	1 195	5 547	4 629	1 237	3 049	2 442
VII	Burbank	6	6 65	1 384	1 148	1 205	4 543	3 438	1 393	3 025	1 795
VIII	Burbank	6	7 59	1 444	1 139	1 279	4 568	3 438	1 267	2 919	2 142
IX	Burbank	14	7 96	1 498	1 150	1 305	4 809	3 663	1 221	3 100	2 586
	Gold Coin	8	8 45	1 454	1 136	1 280	3 922	3 064	1 323	3 244	2 384
IX	**Average**	22	8 14	1 482	1 145	1 287	4 481	3 445	1 258	3 148	2 512
X	Burbank	6	6 84	1 473	1 148	1 283	5 447	4 241	1 174	2 746	2 141
	Cobbler	3	7 02	1 451	1 179	1 233	5 014	4 066	1 400	3 418	2 364
	Downing	4	7 72	1 498	1 196	1 252	4 828	3 958	1 397	3 817	3 077
	Ohio	4	7 11	1 492	1 191	1 253	5 421	4 332	1 325	3 451	2 751
	Peach Blow	4	6 89	1 486	1 163	1 278	5 566	4 356	1 227	2 939	2 262
	Rural	6	5 48	1 363	1 155	1 180	5 266	4 461	1 234	2 774	1 941
X	**Average**	27	6 75	1 454	1 168	1 244	5 282	4 222	1 275	3 118	2 368
XI	Pearl	38	7 20	1 473	1 131	1 255	5 115	4 093	1 348	3 399	2 545
	Rural	34	7 15	1 477	1 167	1 262	5 112	4 049	1 284	3 798	2 502
XI		72	7 21	1 475	1 148	1 258	5 106	4 072	1 318	3 601	2 787
I-XI	**Average**	338	6 71	1 421	1 150	1 237	4 821	3 897	1 263	3 021	2 136
	PART B, DRY LAND POTATOES										
XII	Late Rose	4	8 13	1 479	1 167	1 267	4 497	3 479	1 446	3 613	2 494
	Ohio	3	9 01	1 538	1 170	1 314	4 432	3 373	1 511	3 752	2 461
	Pearl	8	7 53	1 495	1 181	1 266	5 084	4 015	1 477	3 482	2 181
	Peach Blow	3	6 66	1 478	1 165	1 269	5 701	4 494	1 338	2 910	1 810
XII	**Average**	18	7 78	1 495	1 173	1 274	4 927	3 863	1 452	3 460	2 235
XIII	Peach Blow	3	6 60	1 447	1 176	1 229	5 332	4 334	1 447	3 202	1 877
	Rural	3	6 46	1 438	1 170	1 229	5 337	4 342	1 384	3 072	1910
XIII	**Average**	6	6 54	1 442	1 173	1 229	5 334	4 338	1 416	3 137	1 893
XII–XIII	**Average**	24	7 45	1 482	1 173	1 263	5 029	3 986	1 443	3 380	2 149

TABLE VIII

Approximate Constants in Percentage Composition of Potatoes
Averages Arranged with Special Reference to Locality

Locality	Variety of Potato	No. of Tubers Analyzed	Dry Matter − Starch	Starch : Dry Matter :: 1 : x	Total Carbohydrates : Dry Matter :: 1 : x	Starch : Total Carbohydrates :: 1 : x	Starch : Water :: 1 : x	Water : Total Carbohydrates :: 1 : x	Nitrogen ÷ Ash	Nitrogenous Matter − Ash	Ash : Nitrogenous Matter :: 1 : x
PART A,	**IRRIGATED POTATOES**			x	x	x	x	x			x
Carbondale	Burbank	45	7.61	1.445	1.139	1.265	4.444	3.495	1.252	3.051	2.341
	Cobbler	3	6.99	1.402	1.144	1.225	4.352	3.551	1.288	3.075	2.245
	Gold Coin	8	8.45	1.454	1.136	1.280	3.922	3.064	1.323	3.244	2.284
	Average	**56**	**7.70**	**1.444**	**1.139**	**1.279**	**4.368**	**3.438**	**1.267**	**3.072**	**2.359**
Divide	Burbank	6	6.48	1.384	1.148	1.205	4.543	3.438	1.393	3.025	1.795
	Cobbler	6	6.58	1.421	1.146	1.240	4.969	4.008	1.128	2.828	2.572
	Ohio	5	6.40	1.399	1.209	1.158	4.839	4.126	1.509	3.872	2.656
	Peach Blow	6	5.25	1.379	1.210	1.140	5.831	4.810	1.030	2.364	1.940
	Pearl	6	6.42	1.481	1.179	1.256	6.010	4.786	1.241	3.002	2.315
	Triumph	3	4.88	1.379	1.194	1.155	6.391	5.533	1.057	2.885	3.067
	Average	**32**	**6.41**	**1.410**	**1.179**	**1.197**	**5.359**	**4.405**	**1265**	**3.045**	**2.308**
Greeley	Brown Beauty	6	7.33	1.492	1.169	1.336	5.230	4.094	1.388	3.319	2.216
	Burbank	12	6.72	1.459	1.157	1.260	5.343	4.240	1.223	2.904	2.212
	Cobbler	9	6.77	1.449	1.193	1.204	5.230	3.973	1.367	3.448	2.560
	Downing	4	7.72	1.498	1.196	1.252	4.828	3.958	1.397	3.847	3.077
	Ohio	10	6.33	1.413	1.179	1.197	5.061	4.226	1.250	3.317	2.879
	Peach Blow	10	6.49	1.434	1.175	1.242	5.250	4.225	1.212	2.997	2.258
	Pearl	44	7.12	1.472	1.137	1.253	5.179	4.145	1.342	3.441	2.552
	Rural	46	6.80	1.432	1.166	1.244	5.165	4.151	1.243	3.576	2.586
	Triumph	3	5.67	1.419	1.198	1.192	6.100	5.131	1.159	3.137	3.010
	Average	**144**	**6.86**	**1.455**	**1.160**	**1.243**	**5.174**	**4.169**	**1.298**	**3.400**	**2.494**
San Luis Valley	Blue Victor	6	6.80	1.432	1.123	1.275	4.921	3.858	1.210	2.466	1.788
	Brown Beauty	19	6.26	1.382	1.122	1.232	4.719	3.831	1.214	2.451	1.469
	Burbank	37	6.83	1.417	1.127	1.257	4.688	3.730	1.232	2.653	1.627
	Cobbler	6	6.66	1.419	1.098	1.293	4.874	3.770	1.074	1.936	1.127
	Peach Blow	3	5.40	1.351	1.130	1.196	5.143	4.302	1.192	2.389	1.478
	Pearl	19	5.10	1.300	1.120	1.161	4.559	3.928	1.159	2.291	1.468
	Rural	16	5.38	1.279	1.116	1.146	3.911	3.412	1.285	2.524	1.344
	Average	**106**	**6.29**	**1.367**	**1.120**	**1.220**	**4.571**	**3.746**	**1.215**	**2.472**	**1.481**
Irrigated Potatoes Average		**338**	**6.71**	**1.421**	**1.150**	**1.237**	**4.821**	**3.897**	**1.263**	**3.021**	**2.136**
PART B,	**DRY LAND POTATOES**										
Briggsdale	Late Rose	4	8.13	1.479	1.167	1.267	4.407	3.479	1.446	3.613	2.494
	Ohio	3	9.01	1.538	1.170	1.314	4.432	3.373	1.511	3.752	2.461
	Pearl	8	7.53	1.495	1.181	1.266	5.084	4.015	1.477	3.482	2.180
	Peach Blow	6	6.63	1.462	1.170	1.249	5.516	4.416	1.393	3.056	1.843
	Rural	3	6.46	1.438	1.170	1.229	5.337	4.342	1.384	3.072	1.910
Dry Land Potatoes Average		**24**	**7.45**	**1.482**	**1.173**	**1.263**	**5.029**	**3.986**	**1.443**	**3.380**	**2.149**

TABLE IX

Approximate Constants in Percentage Composition of Potatoes
Averages Arranged with Special Reference to Variety of Potato

Variety	Grower	No. of Tubers Analyzed	Dry Matter – Starch	Starch : Dry Matter : : 1 : x	Total Carbohydrates : Dry Matter : : 1 : x	Starch : Total Carbohydrates : : 1 : x	Starch : Water : : 1 : x	Total Carbohydrates : Water : : 1 : x	Nitrogen + Ash	Nitrogenous Matter + Ash	Ash : Nitrogenous Matter : : 1 : x
PART A, IRRIGATED POTATOES				x	x	x	x	x			x
Blue Victor	I	6	6.81	1.432	1.123	1.275	4.921	3.858	1.260	2.466	1.388
Brown Beauty	I	19	6.26	1.382	1.122	1.232	4.719	3.831	1.214	2.451	1.469
	III	6	7.33	1.492	1.169	1.336	5.230	4.094	1.388	3.319	2.216
Average		**25**	**6.89**	**1.408**	**1.133**	**1.257**	**4.841**	**3.894**	**1.255**	**2.659**	**1.648**
Burbank	I	37	6.83	1.417	1.127	1.257	4.688	3.730	1.232	2.653	1.627
	III	6	6.61	1.445	1.166	1.236	5.238	4.238	1.273	3.061	2.283
	V	25	7.42	1.409	1.139	1.237	4.170	3.356	1.272	3.055	2.288
	VII	6	6.48	1.384	1.148	1.205	4.543	3.438	1.393	3.025	1.795
	VIII	6	7.69	1.444	1.139	1.279	4.568	3.438	1.267	2.919	2.359
	IX	14	7.96	1.498	1.150	1.305	4.800	3.663	1.221	3.100	2.586
	X	6	6.84	1.473	1.148	1.283	5.449	4.241	1.174	2.746	2.141
Average		**100**	**7.18**	**1.430**	**1.134**	**1.249**	**4.558**	**3.606**	**1.244**	**2.841**	**2.027**
Cobbler	I	6	6.66	1.419	1.098	1.293	4.874	3.770	1.074	1.936	1.127
	IV	6	6.65	1.448	1.201	1.190	4.736	3.927	1.350	3.464	2.658
	V	3	6.99	1.402	1.144	1.225	4.352	3.551	1.288	3.075	2.243
	VI	6	6.58	1.421	1.146	1.240	4.969	4.008	1.128	2.828	2.512
	X	3	7.02	1.415	1.179	1.233	5.014	4.066	1.400	3.418	2.364
Average		**24**	**6.73**	**1.428**	**1.151**	**1.238**	**4.819**	**3.878**	**1.224**	**2.868**	**2.150**
Downing	X	**4**	**7.72**	**1.498**	**1.196**	**1.252**	**4.828**	**3.958**	**1.397**	**3.847**	**3.077**
Gold Coin	IX	**8**	**8.45**	**1.454**	**1.136**	**1.280**	**3.922**	**3.064**	**1.323**	**3.244**	**2.384**
Ohio	IV	6	6.65	1.448	1.201	1.190	4.736	3.927	1.350	3.464	2.658
	VI	5	6.40	1.399	1.209	1.158	4.839	4.126	1.509	3.872	2.656
	X	4	7.11	1.492	1.191	1.253	5.421	4.332	1.325	3.451	2.751
Average		**15**	**6.69**	**1.442**	**1.201**	**1.196**	**4.953**	**4.101**	**1.383**	**3.596**	**2.681**
Peach Blow	I	3	5.40	1.351	1.130	1.196	5.143	4.302	1.192	2.389	1.478
	IV	6	6.20	1.392	1.160	1.200	4.926	4.105	1.258	3.037	2.303
	VI	6	5.25	1.379	1.210	1.140	5.831	4.810	1.030	2.364	1.940
	X	4	6.89	1.486	1.163	1.278	5.566	4.356	1.227	2.939	2.262
Average		**19**	**5.34**	**1.401**	**1.171**	**1.196**	**5.324**	**4.411**	**1.169**	**2.701**	**2.049**
Pearl	I	19	5.10	1.300	1.120	1.161	4.559	3.928	1.159	2.291	1.468
	III	6	6.62	1.466	1.179	1.243	5.567	4.480	1.308	3.324	2.594
	VI	6	6.42	1.481	1.179	1.256	6.010	4.786	1.241	3.002	2.315
	XI	38	7.20	1.473	1.131	1.255	5.115	4.093	1.348	3.399	2.545
Average		**69**	**6.50**	**1.425**	**1.136**	**1.228**	**5.081**	**4.141**	**1.240**	**3.119**	**2.233**
Rural	I	16	5.38	1.279	1.116	1.146	3.911	3.412	1.285	2.524	1.344
	III	6	6.18	1.418	1.175	1.207	5.366	4.422	1.326	3.124	2.178
	X	6	5.48	1.363	1.155	1.180	5.266	4.461	1.234	2.774	1.941
	XI	34	7.15	1.477	1.167	1.262	5.112	4.049	1.284	3.798	2.502
Ave age		**62**	**6.54**	**1.406**	**1.154**	**1.218**	**4.841**	**4.000**	**1.251**	**3.032**	**1.896**
Triumph	IV	3	5.67	1.419	1.198	1.192	6.100	5.131	1.159	3.157	3.010
	VI	3	4.88	1.379	1.194	1.155	6.391	5.533	1.057	2.885	3.067
Average		**6**	**5.22**	**1.399**	**1.196**	**1.173**	**6.245**	**5.342**	**1.108**	**3.011**	**3.038**
		338	**6.71**	**1.421**	**1.150**	**1.237**	**4.821**	**3.897**	**1.263**	**3.021**	**2.136**
PART B, DRY LAND POTATOES											
Late Rose	XII	**4**	**8.13**	**1.479**	**1.167**	**1.267**	**4.407**	**3.479**	**1.446**	**3.613**	**2.494**
Ohio	XII	**3**	**9.01**	**1.538**	**1.170**	**1.314**	**4.432**	**3.373**	**1.511**	**3.752**	**2.461**
Pearl	XII	**8**	**7.53**	**1.495**	**1.181**	**1.266**	**5.084**	**4.015**	**1.477**	**3.482**	**2.180**
Peach Blow	XII	3	6.66	1.478	1.165	1.269	5.701	4.494	1.338	2.910	1.810
	XIII	3	6.60	1.447	1.176	1.229	5.332	4.334	1.447	3.202	1.877
Average		**6**	**6.63**	**1.462**	**1.170**	**1.249**	**5.516**	**4.416**	**1.393**	**3.056**	**1.843**
	XIII	**3**	**6.46**	**1.438**	**1.170**	**1.229**	**5.337**	**4.342**	**1.384**	**3.072**	**1.910**
		24	**7.45**	**1.482**	**1.173**	**1.263**	**5.029**	**3.986**	**1.443**	**3.380**	**2.149**

TABLE X

Applications of Approximate Constants to Greeley District Potatoes

Part A, Potatoes above 100 g. in weight

1	2	3	4	Weight		7	8	Total Carbohydrates (Calculated)		Starch (Calculated)				Nitrogenous Matter and Ash (Calculated)		
				5	6			9	10	11	12	13	14	15	16	17
Variety Locality	Grower	Year	No. of Tubers Analyzed	Grams	Ounces	Water (Direct Analysis)	Dry Matter (Direct Analysis)	Total Carbohydrates : Dry Matter :: 1 : 1.15	Total Carbohydrates : Water :: 1 : 3.90	Dry Matter : 6.71	Starch : Dry Matter :: 1 : 1.42	Starch : Total Carbohydrates (Col. 9) :: 1 : 1.24	Starch : Water :: 1 : 4.82	Nit. Matter + Ash (Dry Matter — Total Carbohydrates)	Ash (Nitrogenous Matter + Ash) ÷ 3.5	Nitrogenous Matter [(Nit. Matter + Ash) — Ash]
						%	%	%	%	%	%	%	%	%	%	%
Burbank	II	'19	114	338	11.9	76.91	23.00	20.07	19.72	16.28	16.26	16.19	15.96	3.02	.862	2.158
Greeley			115	219	7.7	76.23	23.77	20.67	19.55	17.06	16.74	16.67	15.82	3.10	.885	2.215
			116	184	6.5	74.17	25.83	22.46	19.02	19.12	18.19	18.11	15.39	3.37	.963	2.408
			117	183	6.4	76.86	23.14	19.66	19.71	16.43	16.30	15.85	15.95	3.48	.994	2.486
			118	164	5.8	77.73	22.27	19.36	19.93	15.56	15.68	15.61	16.13	2.91	.831	2.079
			119	133	4.7	74.34	25.66	22.31	19.06	18.95	18.07	17.99	15.42	3.35	.957	2.393
			120	111	3.9	73.34	26.66	23.18	18.81	19.95	18.77	18.69	15.21	3.48	.994	2.486
7 Tubers, Average Composition						75.65	24.35	21.17	19.40	17.64	17.15	17.07	15.69	3.18	.908	2.272
Downing	II	'19	147	262	9.2	77.61	22.39	19.23	19.90	15.68	15.77	15.51	16.10	3.16	.903	2.258
Greeley			148	226	7.9	78.22	21.78	18.94	20.07	15.07	15.34	15.28	16.23	2.84	.811	2.029
			151	302	10.6	77.78	22.22	19.32	19.94	15.51	15.65	15.58	16.14	2.90	.828	2.072
			152	251	8.8	78.24	21.76	18.92	20.06	15.05	15.32	15.26	16.23	2.84	.811	2.029
4 Tubers, Average Composition						77.96	22.04	19.16	19.99	15.33	15.49	15.45	16.17	2.88	.822	2.058
King	II	'19	123	331	11.6	77.00	23.00	20.00	19.74	16.29	16.20	16.13	15.97	3.00	.857	2.143
Greeley			124	285	10.1	76.81	23.19	20.16	19.70	16.48	16.33	16.26	15.94	3.03	.865	2.165
			125	263	9.2	80.56	19.44	16.91	20.66	12.73	13.69	13.64	16.71	2.53	.722	1.808
			126	241	8.5	81.06	18.94	16.47	20.76	12.23	13.34	13.28	16.82	2.47	.705	1.765
			127	148	5.2	74.96	25.04	21.78	19.22	18.33	17.63	17.56	15.55	3.26	.931	2.329
			128	149	5.2	78.21	21.79	18.95	20.05	15.08	15.34	15.28	16.23	2.84	.811	2.029
6 Tubers, Average Composition						78.10	21.90	19.04	20.03	15.19	15.42	15.35	16.20	2.86	.817	2.034

Ohio	II	'19	140	231	8.1	80.67	19.33	16.81	20.68	12.62	13.61	13.56	16.74	2.52	.720	1.800
Greeley			141	182	6.4	76.73	23.27	20.23	19.67	16.56	16.39	16.31	15.92	3.04	.868	2.172
			142	168	5.9	75.73	24.27	21.10	19.42	17.56	17.09	17.02	15.71	3.17	.905	2.265
			143	162	5.7	76.73	23.27	20.23	19.67	16.56	16.39	16.31	15.92	3.04	.868	2.172
			144	160	5.6	77.69	22.31	19.40	19.92	15.60	15.71	15.65	16.12	2.91	.624	1.566
5 Tubers, Average Co	mposit	ion				77.51	22.49	19.56	19.87	15.78	15.84	15.77	16.08	2.93	.837	2.093
Pearl	II	'19	97	371	13.1	79.70	20.30	17.65	20.44	13.59	14.30	14.23	16.54	2.65	.757	1.893
Greeley			98	321	11.3	79.16	20.84	18.12	20.30	14.13	14.68	14.61	16.42	2.72	.777	1.943
			99	167	5.9	77.88	22.12	19.23	19.97	15.41	15.58	15.51	16.16	2.89	.825	2.065
			100	152	5.3	76.96	23.04	20.03	19.73	16.33	16.22	16.15	15.97	3.01	.860	2.150
4 Tubers, Average Co	mposit	ion				78.42	21.58	18.77	20.11	14.87	15.20	15.14	16.27	2.81	.803	2.008
Rural	II	'19	103	456	16.1	77.33	22.67	19.71	19.83	15.96	15.96	15.89	16.04	2.96	.845	2.115
Greeley			104	434	15.3	78.17	21.83	18.98	20.04	15.12	15.37	15.31	16.26	2.85	.814	2.036
			105	369	13.0	77.83	22.17	19.28	19.96	15.46	15.61	15.55	16.15	2.89	.825	2.065
			106	250	8.8	78.88	21.12	18.36	20.23	14.41	14.87	14.81	16.37	2.76	.788	1.972
			107	131	4.6	74.67	25.33	22.03	19.10	18.62	17.84	17.77	15.49	3.30	.942	2.358
			108	119	4.2	73.98	26.02	22.63	18.97	19.31	18.32	18.25	15.35	3.39	.968	2.422
			109	101	3.5	76.20	23.80	20.70	19.54	17.09	16.76	16.69	15.81	3.10	.885	2.215
7 Tubers, Average Co	mposit	ion				76.38	23.62	20.54	19.58	16.91	16.63	16.56	15.85	3.08	.880	2.200
Triumph	II	'19	131	221	7.8	82.55	17.45	15.17	21.17	10.74	12.58	12.23	17.13	2.28	.651	1.629
Greeley			132	213	7.5	81.91	18.09	15.73	21.00	11.38	12.74	12.69	16.99	2.36	.674	1.686
			133	205	7.2	79.50	20.50	17.83	20.38	13.79	14.44	14.38	16.49	2.67	.762	1.908
			134	134	4.7	82.34	17.66	15.36	21.11	10.95	12.44	12.39	17.08	2.30	.657	1.643
			135	127	4.4	81.06	18.94	16.47	20.78	12.23	13.34	13.28	16.82	2.47	.705	1.765
5 Tubers, Average Co	mposit	ion				81.47	18.53	16.11	20.89	11.82	13.05	12.99	16.90	2.42	.691	1.729
38:Tubers, Total Avera	**ge Co**	**mposit**	**ion**			**77.71**	**22.29**	**19.37**	**19.92**	**15.57**	**15.69**	**15.62**	**16.12**	**2.90**	**.830**	**2.077**

TABLE X—Concluded

Application of Approximate Constants to Greeley District Potatoes

Part B, Potatoes below 100 g. in weight

1	2	3	4	Weight		7	8	Total Carbohydrates (Calculated)		Starch (Calculated)				Nitrogenous Matter and Ash (Calculated)		
				5	6			9	10	11	12	13	14	15	16	17
	Grower	Year	No. of Tubers Analyzed	Grams	Ounces	Water (Direct Analysis)	Dry Matter (Direct Analysis)	Total Carbohydrates : Dry Matter : : 1 : 1.15	Total Carbohydrates : Water : : 1 : 3.90	Dry Matter ÷ 6.71	Starch : Dry Matter : : 1 : 1.42	Starch : Total Carbohydrates (Col. 9) : : 1 : 1.24	Starch : Water : : 1 : 4.82	Nit. Matter and Ash (Dry Matter — Total Carbohydrates)	Ash (Nitrogenous Matter ÷ Ash) M 3.5	Nitrogenous Matter [(Nit. Matter + Ash) — Ash]
Burbank	II	'19	121	94	3.3	76.10	23.90	20.78	19.51	17.19	16.83	16.76	15.79	3.12	.891	2.229
Greeley			122	73	2.5	76.65	23.35	20.30	19.65	16.65	16.44	16.37	15.90	3 05	.871	2.179
2 Tubers, Average Co	mposit	ion				76.37	23.63	20.55	19.58	16.92	16.64	16.57	15.84	3.08	.880	2.200
Downing	II	'19	149	92	3.2	76.97	23.03	20.03	19.74	16.32	16.22	16.15	q5.97	3.00	.857	2.143
Greeley			150	65	2.2	81.09	18 91	16.44	20.79	12.20	13.32	13.26	16.82	2.47	.705	1.765
2 Tubers, Average Co	mposit	ion				79.03	20.97	18.23	20.26	14.26	14.77	14.70	16 40	2.74	.782	1.968
King	II	'19	129	79	2.7	80.76	19.24	16.73	20.71	12 53	13.55	13.49	16.76	2.51	.717	1.793
Greeley			130	76	2.6	79.48	20.52	17.84	20.38	13.81	14.45	14.39	16.48	2.68	.765	1.915
2 Tubers, Average Co	mposit	ion				82.12	19.88	17.29	20.54	13.17	14.00	13.94	16.62	2.59	.740	1.850
Ohio	II	'19	145	88	3.0	75.76	24.24	21.08	19.43	17.53	17.07	17.00	15.72	3.16	.903	2.258
Greeley			146	87	3.0	76.36	23.64	20.56	19.58	16.93	16.65	16.58	15.84	.308	.880	2 280
2 Tubers, Average Co	mposit	ion				76.06	23.94	20.82	19.50	17.23	16.86	16.79	15.78	3.12	.891	2.229
Pearl	II	'19	101	{74	2.6}	81.39	18.61	16.18	20.87	11.90	13.11	13.05	16.89	2.43	.694	1.736
Greeley				{81	2.8}											
				{91	3.2}											
			102	{61	2.1}	79.40	20.60	17.91	20.36	13.89	14.51	14.44	16.47	2.69	.967	1.723
2 Tubers, Average Co	mposit	ion				80.39	19.61	17.05	20.61	12.90	13.81	13.75	16.68	2.56	.731	1.829
Rural	II	'19	110	77	2.7	72.88	27.12	23 58	18.69	20.41	19 10	19 02	15 12	3.54	1.011	2.529
Greeley				{69	2.4}											
			111	{57	2 0}	79 49	20.51	17.83	20.38	13 80	14.44	14.38	16 49	2.68	.765	1.915
				{56	1 9}											
			112	{46	1.6}	74 81	25 19	21.90	19 18	18 48	17.74	17 66	15 52	3 29	.940	2.350
			113	48	1.6	70.89	29.11	25 31	18 18	22.40	20.50	20 41	14 71	3 80	1 086	2.714
4 Tubers, Average Co	mposit	ion				74 52	25.48	22 16	19 11	18 77	17 94	17 87	15 46	3 32	.948	2 372
14 Tubers, Total Avera	ge Co	mposit	ion			77 28	22 72	19.75	19 8	16 00	15.99	15 92	16 03	2 49	.845	2 117

TABLE XI

Applications of Approximate Constants to Carbondale District Potatoes

1	2	3	4	Weight		7	8	9	Total Carbohydrates (Calculated)		Starch				Nitrogenous Matter and Ash		
Variety, Locality	Grower	Year	No. of Tubers Analyzed	5 Grams	6 Ounces	Water (Direct Analysis)	Dry Matter (Direct Analysis)	Starch (Direct Analysis)	10 Total Carbohydrates : Dry Matter : : 1 : 1.15	11 Total Carbohydrates : Water : : 1 : 3.90	12 Dry Matter 6.71	13 Starch : Dry Matter : : 1 : 1.42	14 Starch : Total Carbohydrates : : 1 : 1.24	15 Starch : Water : : 1 : 4.82	16 Nitrogenous Matter + Ash (Dry Matter—Total Carbohydrates)	17 Ash (Nit. Matter + Ash) ÷ 3.36	18 Nitrogenous Matter [(Nit. Matter + Ash) — Ash] 2 (Col. 16—Col. 17)
						%	%	%	%	%	%	%	%	%	%	%	%
Burbank Carbondale	V	'23	554	483	17.0	74.53	25.47	18.53	22.15	19.11	18.76	17.94	17.86	15.46	3.320	.988	2.332
			555	444	15.6	80.23	19.77	13.37	17.19	20.57	13.06	13.92	13.86	16.64	2.580	.867	1.713
			556	426	15.0	77.20	22.80	16.39	19.83	19.80	16.09	16.06	15.99	16.02	2.970	.884	2.086
			557	424	14.9	77.87	22.13	15.78	19.24	19.97	15.42	15.58	15.52	16.53	2.890	.860	2.030
			558	417	14.7	77.37	22.63	15.44	19.68	19.88	15.92	15.94	15.87	16.05	2.950	.878	2.072
			559	388	13.7	77.07	22.93	16.50	19.94	19.76	16.22	16.15	16.08	15.99	2.990	.890	2.100
			560	377	13.3	77.67	22.33	15.64	19.42	19.92	15.62	15.73	15.66	16.11	2.910	.866	2.044
			561	372	13.1	77.25	22.75	15.90	19.78	19.81	16.04	16.06	15.95	16.03	2.970	.884	2.086
			562	320	11.6	79.23	20.77	14.21	18.06	20.32	14.06	14.63	14.57	16.44	2.710	.806	1.904
			563	309	10.9	77.90	22.10	15.74	19.22	19.97	15.39	15.56	15.50	16.16	2.880	.857	2.023
			564	305	10.7	76.84	23.16	15.54	20.14	19.70	16.45	16.31	16.24	15.94	3.020	.899	2.121
			565	293	10.3	79.19	20.81	14.80	18.10	20.31	14.10	14.65	14.60	61.43	2.710	.806	1.904
14 Tubers, Average Composition						77.69	22.31	15.63	19.40	19.92	15.60	15.71	15.65	16.12	2.910	.866	2.044

TABLE XII

The Cortex vs. the Medullary Area
(Analyses on Fresh Basis)

Group, Variety, Locality, Portion of Tuber Analyzed	Analysis No.	Wt. of Tuber	Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by diff.)
		g.	%	%	%	%	%	%
Group A Burbank Carbondale a. Cortex	497	344	70.96	29.04	1.816	1.050	21.49	26.17
	500	343	72.18	27.82	2.249	.950	19.75	24.62
	503	239	71.92	28.08	2.108	1.059	21.44	24.91
	507	230	71.44	28.56	1.909	1.048	20.56	25.60
	Average		**71.63**	**28.37**	**2.022**	**1.026**	**20.81**	**25.32**
b. Medullary Area	498	344	73.48	26.52	2.051	.881	19.08	23.58
	501	343	75.30	24.70	2.321	.751	17.53	21.62
	504	239	74.12	25.88	2.312	.831	18.76	22.73
	508	230	74.27	25.73	2.006	.902	17.25	22.82
	Average		**74.29**	**25.71**	**2.172**	**.841**	**18.15**	**22.69**
c. Whole Tuber	499	344	73.75	26.25	2.034	.952	19.38	23.26
	502	343	73.73	26.27	2.343	.926	18.66	23.00
	505	239	73.49	26.51	2.260	.893	19.52	23.35
	509	230	73.39	26.61	1.982	.946	18.27	23.68
	Average		**73.59**	**26.41**	**2.155**	**.929**	**18.96**	**23.32**
Group B Burbank San Luis Valley a. Cortex	510	432	74.62	25.38	2.283	1.082	17.95	22.01
	513	385	73.88	26.12	2.210	.962	19.26	22.94
	516	327	75.55	24.45	2.297	1.044	17.59	21.11
	519	325	72.51	27.49	2.115	1.082	20.84	24.29
	Average		**74.14**	**25.86**	**2.226**	**1.042**	**18.91**	**22.60**
b. Medullary Area	511	432	76.91	23.09	2.188	.812	15.91	20.09
	514	385	77.05	22.95	2.010	.810	16.42	20.13
	517	327	78.45	21.55	2.345	.768	15.46	17.33
	520	325	75.94	24.06	2.285	.841	18.89	20.94
	Average		**77.09**	**22.91**	**2.207**	**.808**	**17.56**	**21.07**
c. Whole Tuber	512	432	75.86	24.14	2.243	.941	16.84	20.95
	515	385	75.84	24.16	2.086	.868	17.51	21.20
	518	327	77.30	22.70	2.326	.877	16.30	19.49
	521	325	74.68	25.32	2.222	.930	19.60	22.25
	Average		**75.92**	**24.08**	**2.219**	**.904**	**17.56**	**20.98**
Group C Rural Greeley a. Cortex	526	361	78.74	21.26	1.969	.951	14.52	18.33
	529	350	73.48	26.52	2.715	1.188	18.16	22.63
	532	344	72.10	27.90	2.762	1.207	18.89	23.93
	535	304	72.20	27.80	2.224	1.125	19.95	24.48
	Average		**74.12**	**25.88**	**2.417**	**1.118**	**17.88**	**22.35**
b. Medullary Area	527	361	82.76	17.24	2.033	.727	11.53	14.48
	530	350	77.39	22.61	2.723	.964	15.24	18.92
	533	344	76.63	23.37	2.763	.943	16.40	19.66
	536	304	76.92	23.08	2.107	.904	16.71	20.07
	Average		**78.42**	**21.58**	**2.406**	**.884**	**14.97**	**18.29**
c. Whole Tuber	528	361	81.07	18.93	2.004	.956	12.87	15.87
	531	350	75.79	24.21	2.720	1.021	16.42	20.47
	534	344	74.60	25.40	2.769	1.013	17.47	21.61
	537	304	74.83	25.17	2.143	1.001	18.14	22.03
	Average		**76.59**	**23.43**	**2.409**	**.998**	**16.22**	**20.03**

TABLE XIII

The Cortex vs. the Medullary Area
(Calculated to Dry Basis)

Group, Variety, Locality, Portion Analyzed	Analysis No.	Wt. of Tuber	Dry Matter (Fresh Basis Table XII)	Nitrogenous Matter	Ash	Starch	Carbohydrates (by dif.)
		g.	%	%	%	%	%
Group A Burbank Carbondale							
a. Cortex	497	344	29.04	6.255	3.615	74.10	90.13
	500	343	27.82	8.083	3.416	70.99	88.50
	503	239	28.08	7.442	3.773	76.35	88.78
	507	230	28.56	6.683	3.663	71.99	89.65
	Average		**28.37**	**7.115**	**3.617**	**73.33**	**88.98**
b. Medullary Area	498	344	26.52	7.735	3.322	71.95	88.94
	501	343	24.70	9.398	3.042	70.97	87.56
	504	239	25.88	8.933	3.210	72.49	87.85
	508	230	25.73	7.798	3.508	67.04	88.70
	Average		**25.71**	**8.462**	**3.270**	**70.61**	**88.27**
c. Whole Tuber	499	344	26.25	7.756	3.627	73.83	88.61
	502	343	26.27	8.930	3.526	70.87	87.55
	505	239	26.51	8.525	3.370	73.63	88.10
	509	230	26.61	7.450	3.556	68.40	88.99
	Average		**26.41**	**8.162**	**3.518**	**71.66**	**88.32**
Group B San Luis Valley							
a. Cortex	510	432	25.38	8.994	4.265	70.72	86.74
	513	385	26.12	8.463	3.685	73.74	87.85
	516	327	24.45	9.394	4.270	71.94	86.33
	519	325	27.49	7.693	3.936	75.81	88.38
	Average		**25.86**	**8.636**	**4.039**	**73.05**	**87.33**
b. Medullary Area	511	432	23.09	9.475	3.517	68.90	87.00
	514	385	22.95	8.756	3.533	71.55	87.71
	517	327	21.55	10.880	3.563	71.74	85.55
	520	325	24.06	9.462	3.498	78.47	87.04
	Average		**22.91**	**9.643**	**3.528**	**72.66**	**87.27**
c. Whole Tuber	512	432	24.14	9.287	3.898	69.74	86.81
	515	385	24.16	8.635	3.596	72.47	87.76
	518	327	22.70	10.250	3.863	71.80	85.88
	521	325	25.32	8.775	3.673	77.43	87.56
	Average		**24.08**	**9.212**	**3.757**	**72.86**	**87.03**
Group C Rural Greeley							
a. Cortex	526	361	21.26	9.281	4.474	68.30	86.24
	529	350	26.54	10.230	4.476	68.37	85.29
	532	344	27.90	9.900	4.327	67.77	85.77
	535	304	27.80	8.000	4.047	71.76	87.95
	Average		**25.88**	**9.353**	**4.341**	**69.05**	**86.30**
b. Medullary Area	527	361	17.24	11.790	4.219	66.88	83.99
	530	350	22.61	12.040	4.265	67.40	83.69
	533	344	23.37	11.820	4.038	70.18	84.14
	536	304	23.08	8.875	3.917	72.10	88.21
	Average		**21.58**	**11.140**	**4.110**	**69.14**	**84.75**
c. Whole Tuber	528	361	18.93	10.587	4.347	69.92	85.06
	531	350	24.21	11.237	4.360	67.84	84.40
	534	344	25.40	10.897	4.178	68.78	84.92
	537	304	25.17	8.450	3.965	72.07	87.58
	Average		**23.43**	**10.293**	**4.212**	**69.15**	**85.50**

TABLE XIV (Dry Basis)

Summary of Irrigated Potatoes
Arranged with Special Reference to Growers

Grower	Variety	No. of Tubers Analyzed	Dry Matter Fresh Basis	Nitrogen	Nitrogenous Matter	Ash	Starch	Carbohydrates (by diff.)	Ratio, Starch : Carbohydrates (by diff.)
			%	%	%	%	%	%	
I	Blue Victor	6	22.55	1.050	6.591	4.634	68.21	88.77	1.303
	Brown Beauty	19	22.65	1.076	6.765	4.354	72.16	88.86	1.231
	Burbank	37	23.11	1.137	7.100	4.195	70.76	88.81	1.255
	Cobbler	6	22.55	.744	4.652	4.035	70.49	91.31	1.295
	Peach Blow	3	20.80	1.092	6.823	4.638	73.91	88.47	1.195
	Pearl	19	22.50	.987	6.179	4.075	74.05	89.74	1.212
	Rural	16	24.51	.861	5.384	4.315	76.17	90.29	1.185
	Average Composition	**106**	**23.02**	**1.029**	**6.433**	**4.249**	**72.34**	**89.30**	**1.234**
III	Brown Beauty	6	22.22	1.654	10.305	4.645	67.22	85.05	1.265
	Burbank	6	21.58	1.585	9.924	4.463	69.17	85.61	1.238
	Pearl	6	20.84	1.847	11.559	4.440	68.07	84.00	1.234
	Rural	6	20.98	1.646	10.100	4.780	70.53	85.11	1.207
	Average Composition	**24**	**21.41**	**1.683**	**10.472**	**4.583**	**69.25**	**84.94**	**1.236**
IV	Cobbler	6	23.42	1.727	10.792	4.074	71.08	85.13	1.198
	Ohio	6	22.00	1.762	10.990	3.689	73.70	85.32	1.158
	Peach Blow	6	21.07	1.537	9.632	4.174	71.60	86.18	1.193
	Triumph	3	18.87	1.996	12.480	4.097	70.52	83.42	1.183
	Average Composition	**21**	**21.97**	**1.726**	**10.758**	**3.996**	**71.89**	**85.24**	**1.183**
V	Burbank	25	22.55	1.331	8.386	3.695	70.83	87.96	1.242
	Cobbler	3	24.37	1.399	8.749	3.825	71.34	87.42	1.225
	Average Composition	**28**	**25.31**	**1.338**	**8.380**	**3.708**	**70.89**	**87.91**	**1.240**
VI	Cobbler	6	22.23	1.454	9.086	3.623	70.53	87.29	1.237
	Ohio	5	22.43	2.008	12.550	4.735	71.37	82.71	1.159
	Peach Blow	6	19.12	1.277	7.977	4.113	72.03	87.91	1.220
	Pearl	6	19.77	1.709	10.680	4.653	67.81	84.63	1.248
	Triumph	3	17.75	1.968	12.360	4.012	72.86	83.62	1.148
	Average Composition	**26**	**20.54**	**1.638**	**10.238**	**4.232**	**70.68**	**85.51**	**1.210**
VII	Burbank	**6**	**23.35**	**1.321**	**8.256**	**4.638**	**72.30**	**87.10**	**1.205**
VIII	Burbank	**6**	**23.63**	**1.470**	**9.184**	**4.084**	**67.91**	**86.73**	**1.277**
IX	Burbank	14	23.83	1.508	9.425	3.642	66.74	86.93	1.302
	Gold Coin	8	27.05	1.349	8.433	3.547	68.48	88.02	1.285
	Average Composition	**22**	**25.23**	**1.450**	**9.064**	**3.607**	**67.37**	**87.32**	**1.295**
X	Burbank	6	21.29	1.355	8.497	4.197	68.36	87.30	1.277
	Cobbler	3	22.48	1.712	10.700	4.519	68.79	84.78	1.232
	Downing	4	23.22	1.986	12.410	4.034	66.81	83.55	1.251
	Ohio	4	21.56	1.878	11.730	4.191	67.00	84.08	1.255
	Peach Blow	4	21.07	1.486	9.303	4.313	65.44	86.38	1.279
	Rural	6	20.59	1.420	8.878	4.569	73.36	86.55	1.180
	Average Composition	**27**	**21.56**	**1.600**	**10.000**	**4.307**	**68.65**	**85.69**	**1.246**
XI	Pearl	38	22.49	1.729	10.871	4.281	67.88	84.86	1.250
	Rural	34	22.40	1.643	10.262	4.111	67.76	85.61	1.264
	Average Composition	**72**	**22.45**	**1.688**	**10.583**	**4.201**	**67.82**	**86.05**	**1.256**
Irrigated, Total Average		**338**	**22.77**	**1.415**	**8.570**	**4.164**	**70.22**	**86.97**	**1.249**

Table XV (Dry Basis)

Summary of Irrigated and Dry Land Potatoes Arranged with Special Reference to Locality

Locality	Variety	No. of Tubers Analyzed	Dry Matter (Fresh Basis)	Nitrogen	Nitrogenous Matter	Ash	Starch	Carbohydrates (by dif.)	Ratio, Starch : Total Carbohydrates
PART A,	**IRRIGATED POTATOES**								
Carbondale	Burbank	45	24.71	1.404	8.788	3.730	69.17	87.48	1.265
	Cobbler	3	24.37	1.399	8.749	3.825	71.34	87.42	1.225
	Gold Coin	8	27.05	1.349	8.433	3.547	68.48	88.02	1.285
56 Tubers,	**Average Comp'n**	**56**	**25.05**	**1.396**	**8.735**	**3.709**	**69.19**	**87.55**	**1.266**
Divide	Burbank	6	23.35	1.321	8.256	4.638	72.30	87.10	1.265
	Cobbler	6	22.03	1.454	9.086	3.623	70.53	87.29	1.237
	Ohio	5	22.43	2.008	12.550	4.735	71.37	82.71	1.159
	Peach Blow	6	19.12	1.277	7.977	4.113	72.03	87.91	1.220
	Pearl	6	19.77	1.709	10.680	4.653	67.81	84.63	1.248
	Triumph	3	17.75	1.968	12.360	4.012	72.86	83.63	1.148
32 Tubers,	**Average Comp'n**	**32**	**21.32**	**1.578**	**9.866**	**4.308**	**70.98**	**85.81**	**1.220**
Greeley	Brown Beauty	6	22.22	1.654	10.305	4.645	67.22	85.05	1.265
	Burbank	12	21.43	1.470	9.205	4.330	68.76	86.46	1.257
	Cobbler	9	23.10	1.722	10.750	4.222	70.31	85.01	1.209
	Downing	4	23.21	1.986	12.410	4.034	66.81	83.55	1.251
	Ohio	10	21.82	1.808	11.210	3.889	71.02	84.82	1.196
	Peach Blow	10	21.65	1.495	9.363	4.114	69.73	86.48	1.236
	Pearl	44	22.26	1.745	10.964	4.303	67.91	84.75	1.248
	Rural	46	21.98	1.614	10.061	4.258	68.85	85.67	1.245
	Triumph	3	18.87	1.996	12.480	4.097	70.52	83.42	1.183
144 Tubers,	**Average Comp'n**	**144**	**22.02**	**1.672**	**9.862**	**4.247**	**68.98**	**85.29**	**1.240**
San Luis Valley	Blue Victor	6	22.55	1.050	6.591	4.634	68.21	88.77	1.303
	Brown Beauty	19	22.65	1.076	6.765	4.354	72.16	88.86	1.249
	Burbank	37	23.11	1.137	7.100	4.195	70.76	88.18	1.282
	Cobbler	6	22.55	.744	4.652	4.035	70.49	91.31	1.295
	Peach Blow	3	20.80	1.092	6.823	4.638	73.91	88.47	1.197
	Pearl	19	22.50	.987	6.179	4.075	74.05	89.74	1.243
	Rural	16	24.51	.861	5.384	4.315	76.17	90.29	1.204
106 Tubers,	**Average Comp'n**	**106**	**23.02**	**1.029**	**6.433**	**4.249**	**72.34**	**89.30**	**1.264**
Total: 338 T	**ubers, Av. Comp'n**	**338**	**22.77**	**1.415**	**8.570**	**4.164**	**70.22**	**86.97**	**1.249**
PART B,	**DRY LAND POTATOES**								
	Late Rose	4	25.13	1.652	10.284	4.117	67.61	85.59	1.266
	Ohio	3	25.76	1.657	10.390	4.197	65.21	85.41	1.310
	Pearl	8	22.73	1.679	10.591	4.838	66.86	84.59	1.265
	Peach Blow	6	20.97	1.521	9.528	4.644	68.41	85.82	1.254
	Rural	3	21.23	1.528	9.551	4.989	69.54	85.46	1.229
24 Tubers.	**Average Comp'n**	**24**	**22.88**	**1.613**	**10.127**	**4.608**	**68.08**	**85.27**	**1.263**

TABLE XVI (Dry Basis)

Summary of Irrigated Potatoes
Arranged with Special Reference to Variety

Variety	Grower	No. of Tubers Analyzed	Dry Matter (Fresh Basis)	Nitrogen	Nitrogenous Matter	Ash	Starch	Total Carbohydrates	Ratio, Starch: Total Carbohydrates
			%	%	%	%	%	%	
Blue Victor	I	6	22.55	1.050	6.591	4.634	68.21	88.77	1.303
Brown Beauty	I	19	22.65	1.076	6.765	4.354	72.16	88.86	1.231
	III	6	22.22	1.654	10.305	4.645	67.22	85.05	1.265
Average Composition		25	22.55	1.214	7.587	4.423	70.98	87.99	1.240
Burbank	I	37	23.11	1.137	7.100	4.195	70.76	88.81	1.242
	III	6	21.58	1.585	9.924	4.463	69.17	85.61	1.238
	V	25	22.55	1.331	8.386	3.695	70.83	87.96	1.242
	VII	6	23.35	1.321	8.256	4.638	72.30	87.10	1.205
	VIII	6	23.63	1.470	9.184	4.084	67.91	86.73	1.277
	IX	14	23.83	1.508	9.425	3.642	66.74	86.93	1.302
	X	6	21.29	1.355	8.497	4.197	68.36	87.30	1.277
Average Composition		100	25.76	1.308	8.175	4.028	70.17	87.80	1.251
Cobbler	I	6	22.55	.744	4.652	4.035	70.49	91.31	1.295
	IV	6	23.42	1.727	10.792	4.074	71.08	85.13	1.198
	V	3	24.37	1.399	8.749	3.825	71.34	87.42	1.225
	VI	6	22.23	1.454	9.086	3.623	70.53	87.29	1.237
	X	3	22.48	1.712	10.700	4.519	68.79	84.78	1.232
Average Composition		24	23.91	1.370	8.559	3.967	70.54	87.46	1.232
Downing	X	4	23.22	1.986	12.410	4.034	66.81	83.55	1.251
Gold Coin	IX	8	27.05	1.349	8.433	3.549	68.48	88.02	1.285
Ohio	IV	6	22.00	1.762	10.990	3.689	73.70	85.32	1.158
	VI	5	22.43	2.008	12.550	4.735	71.37	82.71	1.159
	X	4	21.56	1.878	11.730	4.191	67.00	84.08	1.255
Average Composition		15	22.03	1.874	11.650	4.171	71.13	84.12	1.183
Peach Blow	I	3	20.80	1.092	6.823	4.638	73.91	88.47	1.195
	IV	6	21.07	1.537	9.632	4.174	71.60	86.18	1.193
	VI	6	19.12	1.277	7.977	4.113	72.03	87.91	1.220
	X	4	21.07	1.486	9.303	4.313	65.44	86.38	1.279
Average Composition		19	20.72	1.373	8.581	4.257	70.80	86.97	1.228
Pearl	I	19	22.50	.987	6.179	4.075	74.05	89.74	1.212
	III	6	20.84	1.847	11.559	4.440	68.07	84.00	1.234
	VI	6	19.77	1.709	10.680	4.653	67.81	84.63	1.248
	XI	38	22.49	1.729	10.871	4.281	67.88	84.86	1.250
Average Composition		69	22.13	1.533	9.581	4.270	69.59	86.15	1.238
Rural	I	16	24.51	.861	5.384	4.315	76.17	90.29	1.185
	III	6	20.98	1.646	10.100	4.784	70.53	85.11	1.207
	X	6	20.59	1.420	8.878	4.569	73.36	86.55	1.180
	XI	34	22.40	1.643	10.262	4.111	67.76	85.61	1.264
Average Composition		62	22.66	1.420	8.875	4.272	70.73	86.85	1.228
Triumph	IV	3	18.87	1.996	12.480	4.097	70.52	83.42	1.183
	VI	3	17.75	1.968	12.360	4.012	72.86	83.62	1.148
Average Composition		6	18.31	1.982	12.420	4.054	71.69	83.52	1.165
Irrigated, Total Av. Comp'n		338	22.77	1.415	8.570	4.164	70.22	86.97	1.249

TABLE XVII

Chemical Composition of Raw vs. Cooked Potatoes

Variety, Locality Groups	Conditions Under Which Analyzed	Grower	Analysis No.	Weight	Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by dif.)
				g.	%	%	%	%	%	%
Group 1 Burbank Carbondale	Lengthwise half of each tuber, **raw.**	IX	403	470	77.08	22.92	2.206	.796	15.60	19.91
			404	377	74.65	25.35	2.502	.900	16.89	21.94
			405	353	76.43	23.57	2.422	.824	16.03	20.32
			406	332	75.54	24.46	2.239	1.004	16.49	21.18
			407	327	76.63	23.37	2.353	.890	15.60	20.12
			408	263	74.43	25.57	2.217	.995	17.00	22.35
6 Tubers, Raw,	**Average Comp'n**				75.76	24.24	2.335	.902	16.27	21.00
Group 1a	Other half of Nos. 403-408, **boiled** in skin		409		77.50	22.50	2.112	.759	16.20	19.62
			410		75.59	24.41	2.318	.763	16.13	21.33
			411		76.10	23.90	2.296	.805	16.20	20.79
			412		75.87	24.13	2.184	.769	16.45	21.37
			413		75.40	24.60	2.417	.793	15.43	21.39
			414		74.76	25.24	2.333	.727	17.45	22.18
Same Tubers	**Boiled, Average Composition**				**75.87**	**24.13**	**2.285**	**.769**	**16.34**	**21.07**
Group 2 Burbank Carbondale	Lengthwise half of each tuber, **raw**	V	453	505	73.52	26.48	2.040	.934	19.42	23.50
			454	490	71.91	28.09	2.088	1.017	19.68	24.98
			455	487	75.78	24.22	2.183	.939	18.54	21.09
3 Tubers, Raw,	**Average Composition**				73.74	26.26	2.100	.963	19.21	23.19
Group 2a	Other half of Nos. 453-455, **boiled** in skin.		456		74.77	25.23	1.944	.809	18.48	22.47
			457		73.80	26.20	1.865	.777	19.47	23.56
			458		76.06	23.94	2.153	.780	18.72	21.00
Same Tubers,	**Boiled, Average Composition**				**74.87**	**25.12**	**1.987**	**.789**	**18.89**	**22.34**
Group 3 Rural Greeley	Lengthwise half of each tuber, **raw.**	XI	528	361	81.07	18.93	2.004	.956	12.87	15.87
			531	350	75.79	24.21	2.720	1.021	16.42	20.47
			534	344	74.60	25.40	2.769	1.013	16.94	21.61
			537	304	74.83	25.17	2.143	.948	18.17	22.08
4 Tubers, Raw,	**Average Composition**				**76.57**	**23.43**	**2.409**	**.984**	**16.10**	**20.04**
Group 3a	Other half of tubers of Group 3, **boiled** in skin.		538		80.59	19.41	1.914	.826	13.67	16.67
			539		75.43	24.57	2.509	.963	16.98	21.10
			540		74.46	25.54	2.581	.960	16.84	22.00
			541		75.68	24.32	2.163	.843	17.50	21.32
Same Tubers,	**Boiled, Average Composition**				**76.54**	**23.46**	**2.292**	**.903**	**16.25**	**20.27**
Group 4 Late Rose Dry Land	Lengthwise half of each tuber, **raw.**	XII	429	175	74.40	25.60	2.442	1.146	17.29	22.01
			430	156	74.52	25.48	2.424	.988	17.60	22.06
			431	154	75.41	24.59	2.345	1.134	16.44	21.11
			432	149	75.17	24.83	3.106	.870	16.63	20.85
4 Tubers, Raw,	**Average Composition**				**74.87**	**25.13**	**2.579**	**1.034**	**16.99**	**21.52**
Group 4a	Other half of Nos. 429-432, **boiled** in skin.		433		73.55	26.45	2.309	1.059	17.48	23.09
			434		74.84	25.16	2.428	.976	16.80	21.75
			435		74.89	25.11	2.153	.994	16.98	21.86
			436		75.42	24.58	2.876	.892	16.92	20.81
Same Tubers,	**Boiled, Average Composition**				**74.67**	**25.33**	**2.439**	**.980**	**17.04**	**21.91**
Group 5 Downing Greeley	Lengthwise half of each tuber, **raw.**	X	445	189	76.33	23.67	2.963	.944	15.73	19.76
			446	178	76.15	23.85	2.656	.923	17.59	20.27
			447	143	76.45	23.55	2.851	.978	15.16	19.72
			448	143	78.24	21.76	3.025	.892	13.49	17.84
4 Tubers, Raw,	**Average Composition**				**76.79**	**23.21**	**2.876**	**.936**	**15.49**	**19.40**
Group 5a	Other half of Nos. 445-448, **boiled** in skin, **peeled hot.**		449		74.89	25.11	2.839	.771	17.16	21.90
			450		74.81	25.19	2.678	.892	16.92	21.22
			451		74.76	25.24	2.803	.980	16.72	21.45
			452		76.18	23.82	3.002	.880	15.21	19.73
Same Tubers,	**Boiled, Peeled Hot,**	**Average**			**75.16**	**24.84**	**2.830**	**.881**	**16.52**	**21.13**

TABLE XVII Concluded

Variety Locality, Groups	Conditions Under Which Analyzed	Grower	Analysis No.	Weight	Water	Dry Matter	Nitrogenous Matter	Ash	Starch	Carbohydrates (by diff.)
				g	%	%	%	%	%	%
Group 6 Pearls Dry Land	Lengthwise half of each tuber, **raw.**	XII	437	175	79.82	20.18	2.616	1.006	13.15	16.55
			438	153	79.06	20.94	2.576	1.081	14.21	17.28
			439	152	76.60	23.40	2.279	1.168	15.52	19.95
			440	147	76.64	23.36	2.410	1.099	15.68	19.85
4 Tubers, Raw,	**Average Compositio**	**n**			78.03	21.97	2.470	1.088	14.64	18.41
Group 6a	Other half of Nos. 437-440, **boiled** in skin, **peeled hot.**		441		76.85	23.15	2.575	.998	14.25	19.57
			442		76.95	23.05	2.474	1.044	14.75	19.53
			443		72.70	27.30	2.495	.956	17.90	23.84
			444		72.80	27.20	2.629	1.060	17.66	23.11
Same Tubers,	**Boiled, Peeled Hot,**	**Avera**	**ge**		74.85	25.15	2.543	1.014	16.14	21.56
Group 7 Burbank Carbondale	Whole tuber **boiled unpeeled, peeled hot.**	V	423	483	73.12	26.88	2.283	.736	17.68	23.86
			424	439	73.90	26.10	2.185	.732	18.62	23.18
			425	340	71.51	28.49	2.325	.746	20.60	25.41
3 Tubers, Boil	**ed, Average Compos**	**ition**			72.84	27.16	2.264	.738	18.97	24.15
Group 8 Burbank Carbondale	Whole tuber, **peeled, then boiled.**	V	426	426	73.08	26.92	2.228	.836	18.23	23.85
			427	409	72.18	27.82	2.196	.880	20.32	24.74
			428	347	72.29	27.71	2.132	.770	20.00	24.81
3 Tubers, Boil	**ed, Average Compos**	**ition**			72.52	27.48	2.207	.829	19.52	24.44
Group 25, Table	**I, 10 Tubers, Averag**	**e Com**	**position**		73.77	26.23	1.964	989	18.94	23.27
Group 9 Burbank San Luis Valley	Lengthwise half of tuber, **boiled** in skin	I	542	297	77.41	22.59	2.201	.764	16.05	19.62
			543	267	75.59	24.41	2.111	.884	16.95	21.41
			544	269	74.21	25.79	1.907	.951	19.13	22.93
			545	242	75.49	24.51	2.127	.873	15.63	21.50
			546	237	74.96	25.04	2.235	.850	17.09	21.95
			547	223	72.10	27.90	2.276	.890	18.53	24.73
6 Tubers, Boil	**ed, Average Compos**	**ition**			74.96	25.04	2.143	.870	17.23	22.03
Group 10 Burbank	Other half of Nos. 542 547, **steamed** in skin.		548		77.00	23.00	2.323	.849	15.59	19.83
			549		75.68	24.32	2.167	.919	16.78	21.23
			550		72.42	27.58	1.908	1.029	19.89	24.64
			551		74.90	25.10	2.202	.940	16.67	21.95
			552		74.83	25.17	2.246	.962	16.99	21.96
			553		71.88	28.12	2.367	1.006	18.69	24.74
6 Tubers, stea	**med, Average Comp**	**osition**			74.45	25.55	2.202	.957	17.43	22.39
Group 11 Burbank Carbondale	**Baked,** steam allowed to escape after cooking.	IX	310	441	69.72	30.28	2.774	.857	19.11	26.64
			311	321	69.56	30.44	2.886	.945	20.44	26.60
			312	323	64.38	35.62	2.939	1.146	25.83	31.53
			313	264	63.98	36.02	4.003	1.486	24.11	30.53
4 Tubers, Bak	**ed, Average Compos**	**ition**			66.91	33.09	3.150	1.109	22.38	28.55
Burbank Carbondale	**Baked,** steam not allowed to escape.	IX	314	313	76.30	23.70	2.401	.977	18.42	19.95
Group 28, Table	**I, 14 Tubers, Averag**	**e. C**	**omposit**	**ion**	76.17	23.83	2.236	.864	15.87	20.72

INDEX

INDEX—Continued